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An Economic Analysis of the Performance of the Sugar Refining Industry in Canada

by

©

Caleb Waswa Waudo Wangia

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled An Economic Analysis of the Performance of the Sugar Refining Industry in Canada submitted by Caleb Waswa Waudo Wangia in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Agricultural Economics.

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ABSTRACT

This study assessed the level of and factors affecting the economic performance of the Canadian sugar refining industry for the period of time from 1960 to 1978. The data for this study were from court transcripts of the anticombines case of 1974 to 1980 concerning Atlantic, Redpath and St. Lawrence sugar refiners (the case is referred to as the *Atlantic Sugar* case) and from published data.

The study shows that the refining industry was highly concentrated on both the national and regional levels from 1960 to 1978. The largest four sugar refiners controlled over 80 percent of all sugar shipments in Canada. This situation does not appear to have changed since 1978.

The high levels of concentration seem to be attributable to a number of barriers to entry into the Canadian sugar refining industry. The study shows that the main barriers to entry appear to have been the exclusionary strategies which were employed by Atlantic, Redpath and St. Lawrence against potential competitors in Canada between 1960 and 1973. That is, evidence from court transcripts in the *Atlantic Sugar* case indicates that prospective refiners and importers of sugar were denied access to raw and refined sugar on the world market.

Another main barrier to entry into the refining industry may have been the existence of considerable excess

capacity in the eastern Canadian sugar refining industry from 1960 to 1973. Over this period, utilization of plant capacity in eastern Canada was generally less than 70 percent, with some plants operating at less than 60 percent of full capacity. The situation does not appear to have changed between 1973 and 1978. The considerable excess capacity in this industry is indicative of low levels of technical efficiency.

An analysis of effective tariff protection afforded the Canadian sugar refining industry from 1960 to 1978 shows that this industry is highly protected by customs tariffs. The high effective rates of protection suggest that exporters of refined sugar to Canada faced substantial barriers to entry into the Canadian market for refined sugar.

The study indicates that plant economies of scale in the refining of sugar in eastern Canada in 1963 were moderate. The high levels of concentration in the Canadian sugar refining industry do not appear to have been warranted by economies of large scale.

The analysis indicates that relative shares of the market for refined sugar realized by Atlantic, Redpath and St. Lawrence were stable from 1940 to 1973. The evidence from court transcripts of the *Atlantic Sugar* case and economic theory of oligopoly suggest that stable market shares probably were due to market collusion and this seems to have been associated with the lessening of competition in the eastern Canadian market for refined sugar.

Evidence from court transcripts in the *Atlantic Sugar* case and from other sources suggests that the pricing of refined sugar at the plant-gate by Atlantic, Redpath and St. Lawrence from 1960 till now has been on a cost-plus formula. This method of pricing tended to give identical prices for refined sugar. It is evident that identical prices for refined sugar essentially have eliminated price competition between refiners in eastern Canada from 1960 till now.

The relationship between prices of raw sugar on the London Sugar Terminal market, refined sugar in Canada and the United States was evaluated. Also, the relationship between wholesale and retail prices of refined sugar in different markets in Canada was examined. The series of prices used in these analyses were for different periods of time between 1960 and 1980. The analyses included using correlation coefficients, econometric models and graphical illustrations. The results show that there were high correlations between prices of sugar in London, Canada and the United States. Also, there were high correlations between wholesale and retail prices for refined sugar in different markets in Canada. It is concluded that these high correlations are indicative of market integration in the pricing of sugar at the different levels of the marketing channels.

An assessment of profits earned by Canadian refiners and cane sugar refiners in the United States suggests that

Canadian refiners earned above normal profits compared to those of cane sugar refiners in the United States between 1960 and 1973. The results are inconclusive for 1974 to 1978. Estimates of losses in consumer surplus due to the exertion of market power by the Canadian refiners appear to be substantial. It is concluded that the performance of the Canadian sugar refining industry was unsatisfactory in terms of both the technical and allocative efficiency criteria.

It is recommended that the differences between customs tariff rates on imports of raw and refined sugar be reduced. This would reduce the level of effective tariff protection afforded the refining industry. This would also be expected to increase competition from imports of refined sugar. It is also recommended that the anticombines law be reformed to cover parallel behavior of firms where such conduct has adverse economic effects on competition in an industry.

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I. INTRODUCTION AND SCOPE OF THE STUDY

This study undertakes an economic analysis of the market performance of the sugar refining industry in Canada between 1960 and 1978. It focuses in particular on some aspects of technical and allocative efficiency. The analysis of the refining industry uses the structure, conduct and performance paradigm of industrial organization.[1] The study examines policy initiatives which might improve competition and performance in the refining industry. Additionally, it is hoped that, by providing a comprehensive assessment of the industrial structure, conduct and performance of the Canadian sugar refining industry, this will aid in a more effective definition and application of competition policy.

This chapter is divided into four parts. The first part describes the historical background of this study. The second part outlines more fully the objectives of the study. A third part briefly summarizes the major results. The final section outlines the methods used in the study and the organization of subsequent chapters.

A. The Historical Background of the Study

Between 1960 and 1980, major sugar refiners in Canada were investigated and subsequently charged with lessening market competition contrary to the anticombines regulations. The first case was concerned with the merger of the British

---

[1] F.M.Scherer, *Industrial Market Structure and Economic Performance* (Chicago: Rand McNally College Publ., 1970), 4-6.

Columbia Sugar Refineries and the Manitoba Sugar Company (hereafter referred to as B.C. Sugar and Manitoba Sugar, respectively) in 1955. The case followed a comprehensive report by the Restrictive Trade Practices Commission (1957) on the market structure, conduct and performance of the western Canadian sugar refining industry.[2] The Commission maintained that the merger would lessen competition in the market for refined sugar in western Canada.[3] This body recommended the dissolution of the merger and the reduction of customs duties on imports of refined sugar. B.C. Sugar was prosecuted for the formation of an illegal merger to the detriment of the public interest. The Manitoba Court of Queen's Bench which heard this case required the Crown to prove beyond a reasonable doubt that the merger was to the detriment of the public interest.[4] The Judge contended that there was potential competition in the market for refined sugar in Manitoba from sugar refiners in eastern Canada and from imported sugar. The court allowed the merger on the grounds that competition had not been lessened unduly, that is, to the detriment of the public interest.

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[2] Canada, Dept. of Justice, Restrictive Trade Practices Commission, *Report Concerning the Sugar Industry in Western Canada and a Proposed Merger of Sugar Companies* (Ottawa: Queen's Printers, 1957); and *Idem*, *Report Concerning the Sugar Industry in Eastern Canada* (Ottawa: Queen's Printers, 1960).

[3] For a more detailed discussion of the conclusions and recommendations, see *Ibid.*, (1957), 182-183.

[4] For a detailed presentation of the arguments and the judgement in this case, see *Regina v British Columbia Sugar Refining Company and B.C. Sugar Refinery* (1961) 129 Canadian Criminal Cases (CCC) 7. For a review of this case, see C. Green, *Canadian Industrial Organization and Policy* (Toronto: McGraw-Hill Ryerson, 1980), 179-188.

The decision of the court to allow the merger was central to the evolution and maintenance of two distinct markets in the sugar refining industry in Canada, the eastern and western sugar markets. It seems that the subsequent effect of the merger was the elimination of competition in the market for refined sugar in western Canada (Green, 1980).[5] It is one of the objectives of this study to assess the subsequent impact of the merger on the market performance of the refining industry in western Canada.

In 1963, Atlantic Sugar Refineries Company, Canada and Dominion Sugar Company (now called Redpath Industries) and St. Lawrence Sugar Company (hereafter referred to as Atlantic, Redpath and St.Lawrence, respectively), were jointly charged with lessening competition in the eastern Canadian sugar refining industry contrary to the anticombines law. These refiners had lessened competition in that region by restricting imports of refined sugar from Cuba.[6] The arrangement was that the Canadian refiners agreed to purchase large quantities of raw sugar from Cuba provided that refined sugar from Cuba was not exported to Canada. Atlantic, Canada and Dominion (now Redpath) and St. Lawrence were prosecuted and convicted under the anticombines law in

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[5] *Ibid.*, (1980), 185.

[6] This was the conclusion of the Restrictive Trade Practices Commission. For a more detailed discussion, see Canada, Dept. of Justice, *op. cit.*, (1960), 312-314.

1963. These refiners were fined two thousand five hundred dollars each, and, under the terms of a prohibition order, were directed not to continue the undesirable trade practices.[7] However, in 1974, these same refiners (Atlantic, Redpath and St. Lawrence) were charged with conspiring to lessen competition unduly and enhance unreasonably the price for refined sugar in Canada from 1960 to 1973. Three court decisions rendered respectively by a trial court, a court of appeal and the Supreme Court of Canada (in 1975, 1978 and 1980) were far from definitive on both economic and legal bases.[8] This study undertakes an economic analysis of the acquittal of Atlantic, Redpath and St. Lawrence in that case (hereafter referred to as the *Atlantic Sugar* case) and the implications of the acquittal for competition policy. This study also builds on a study by the Tariff Board (1971) concerning the level of tariff protection afforded the sugar refining industry in Canada, and two studies by the Food Prices Review Board (1974 and 1975) concerning the level of sugar prices in Canada.[9]

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[7] See *Atlantic Sugar Refineries Ltd. et al. V the Queen* (July 1964), Quebec Court of Queen's Bench.

[8] For a detailed presentation of the decisions of the Judges in the three courts, see *Regina v Atlantic Sugar Refineries Ltd. et al.* (1976) 421 C.S., 424; *Idem*, (1978) 41 CCC, 209; *Atlantic Sugar Refineries et al. v The Attorney General of Canada* (1980) 16 Criminal Reports, 128; and Chapter IV of this study.

[9] The Tariff Board, *Sugar*, Reference Number 146, (Ottawa: Information Canada, 1971). Food Prices Review Board, *Sugar Prices and Policies* (Ottawa: July 1974); *Idem*, *Sugar Prices II: The Canadian Sugar Refining Industry* (Ottawa: August 1975).

B. Objectives of the Study

The sugar refining industry is selected as the focus of the study for a number of reasons. First, it is an industry in which major firms were recently (1969 to 1973) investigated under anticombines law for allegedly lessening competition. That investigation and the subsequent trial transcripts provide an extensive data base on the industry. Second, many economists, lawyers, judges, consumers and officials of the Bureau of Competition Policy have expressed concern about the state of competition and market performance of the refining industry. Third, given the general concern raised by many scholars about the effectiveness of the existing anticombines law, an examination of the recent anticombines actions in this industry provides revealing insight into some of the inherent weaknesses in the legislation. Finally, since the industry is accurately described as a "tight oligopoly", an analysis of the industry permits the application of some traditional models of oligopoly behavior.

There are two main objectives of this study. The first is to contribute to a better understanding of the market conduct and performance of the sugar refining industry in Canada. The second is to examine factors of market structure and conduct which may have had an impact on the levels of competition in and technical and allocative efficiency[10] of the refining industry. It is the objective of this study to indicate the level of economic efficiency in the industry as well as to estimate economic losses due to the exertion of market power by the Canadian sugar refiners.

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[10] Technical and allocative efficiency are described in Chapter V. Technical efficiency is achieved when the production function of a firm (industry) yields the maximum output for a given set of inputs, given its particular

The Hypotheses

Economic theory predicts that the level of technical and allocative efficiency in an industry is closely associated with market structure and conduct. The major general hypotheses postulated are associated with market structure, conduct and performance of the Canadian sugar refining industry. The first is that the level of technical and allocative efficiency in the sugar refining industry in Canada is low. The second general hypothesis is that the low level of technical and allocative efficiency of the refining industry is associated with:

1. the market structure of the sugar refining industry; and
2. the market conduct of the sugar refiners in the industry.

The specific hypotheses are:

1. That average profit rates in the Canadian sugar refining industry have been significantly higher than in the cane sugar refining industry in the United States for the period of time from 1960 to 1978. The implication of

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[10] (cont'd)location and environment (French, 95). Allocative efficiency is achieved when long-run marginal cost, marginal revenue and price are equal. This implies an efficient allocation of resources and the absence of above normal economic profits.

this hypothesis is that higher rates of return in the Canadian refining industry are indicative of a low level of allocative efficiency in this industry compared with the cane sugar refining industry in the United States.

2. That there is not a significant relationship between wholesale prices for refined sugar in spatially separated markets in Canada. The implication of this hypothesis is that there may not be effective price competition between refiners in spatially separated markets for refined sugar in Canada.
3. That there is not a significant relationship between wholesale prices for refined sugar in spatially separated markets in Canada and the United States. The implication of this hypothesis is that there may not be effective competition between Canadian and United States' cane sugar refiners.
4. That there is a significant relationship between the effective rates of tariff protection afforded the Canadian sugar refining industry and profit rates in this refining industry. The implication of this hypothesis is that high levels of tariff protection are related to high profits and thus, low levels of allocative efficiency. This would imply that a reduction in the level of tariff protection would increase allocative efficiency.
5. That there is not a significant difference between the means of market shares for the period of time from 1940

to 1949 and from 1961 to 1973 for the shares of Atlantic, Redpath and St. Lawrence. The implication of this hypothesis is that consistently stable market shares are indicative of market collusion and the lessening of market competition in the refining industry.

These hypotheses are tested using inferential and descriptive statistics.

C. The Main Results

The summary and conclusions of this study are presented in Chapter VII and only the main results are briefly outlined in this section. The first finding is that the Canadian sugar refining industry was highly concentrated on both national and regional levels for the period of time from 1960 to 1978. The high levels of concentration appear to be attributable to three main barriers to entry into the Canadian refining industry. One of these barriers to entry seems to have been the exclusionary tactics employed by Atlantic, Redpath and St. Lawrence against potential competitors (refiners and importers) in Canada. Evidence from the court transcripts of the *Atlantic Sugar* case indicates that potential refiners were denied access to raw and refined sugar on the world market. Probably as a result of the exclusionary strategies of the existing Canadian refiners, entry into the Canadian market for refined sugar was limited, though, as is reported in this study, profits were much higher in this industry than in most other Canadian food processing industries. Another factor seems to have been related to the high levels of effective tariff protection afforded the refining industry for the period of time from 1960 to 1978. The high level of tariff protection represented substantial barriers to entry for exporters of refined sugar to Canada. Another factor related to the high levels of concentration in the refining industry appears to have been the extensive excess capacity in the sugar refining between 1963 and 1975. The excess capacity in the refining industry presents substantial barriers to entry for potential entrants into this industry to the extent that the marginal costs and shut-down prices of existing firms are lower than those of entrants. That is, potential competitors may have been discouraged from entering this industry when there was extensive excess capacity.

The results indicate that there were moderate economies of scale in this industry in 1963. It is estimated that optimum efficient plant sizes in 1963 would have had output of between 30 and 50 thousand tons of refined sugar per year. It is concluded that the high levels of concentration in the refining industry in 1963 were unlikely to be justified by the apparently moderate economies of scale. Economic theory and empirical studies suggest that the high levels of concentration in the refining industry would result in a reduction in competition.

The analysis of pricing mechanisms of refined sugar by Atlantic, Redpath and St. Lawrence shows that the cost-plus formula was used at the refinery. The effect of this formula pricing was that prices of refined sugar at the plant-gates of Atlantic, Redpath and St. Lawrence were basically identical. Thus, price competition between these refiners was limited for the period of time between 1960 and 1973. There is no evidence to indicate that this situation has changed since 1973. Analysis of evidence from transcripts in the court case concerning Atlantic, Redpath and St. Lawrence also suggests that the maintenance of constant market shares by these refiners appears to have been associated with lessened competition between the refiners.

The second general finding is that the levels of technical and allocative efficiency of the Canadian sugar refining industry were low between 1960 and 1973. The low level of technical efficiency is indicated by the existence of excess plant capacity in the refining industry between 1960 and 1968. Another indication of the low level of technical efficiency is that optimum plant sizes in 1963 seemed to have lower total average costs per unit of output than the existing large sugar refineries in that year.

There are indications from evidence on profits in the refining industry that the level of allocative efficiency was low between 1960 and 1973. From 1973 onwards, the level of allocative efficiency seems to have increased, though these results are not conclusive. It seems evident that the low levels of technical and allocative efficiency in the Canadian sugar refining industry have been associated with the high levels of concentration in this industry.

The specific results and conclusions are as follows:

1. A comparison of three sets of profit rates of sugar refiners in Canada and cane sugar refiners in the United States indicates that profit rates of Canadian sugar refiners were considerably higher than those of cane sugar refiners in the United States for the period of time from 1960 to 1973. From 1974 to 1978, price-cost margins expressed as a percentage of the wholesale price of refined sugar in Canada seem to have declined and are almost equal to those of cane sugar refiners in the United States.
2. Wholesale prices for refined sugar in Canada and the United States are highly correlated during the period of time from 1961 to 1978. Similarly, retail prices for refined sugar in spatially separated markets in Canada are highly correlated for the period of time from 1973 to 1980. In a competitive market, these results would be indicative of a high level of allocative efficiency (Hassler, 1953; and Lele, 1968). However, this does not seem to be the case for the Canadian sugar refining industry. Evidence from court transcripts of the *Atlantic Sugar* case (1976, 1978 and 1980) and from the Tariff Board (1971) on the pricing of sugar by the refiners suggests that the strong relationship is due to

the cost-plus and the base point pricing systems used by Canadian refiners during this period of time. In addition, evidence from court transcripts in the *Atlantic Sugar* case shows that the cost components included in the cost-plus formula of pricing refined sugar by Atlantic, Redpath and St. Lawrence tended to be higher than the actual costs. This substantially inflated prices for refined sugar to Canadian consumers. Thus, the high levels of correlation between prices of refined sugar in different markets are most probably due to administered pricing of refined sugar by the refiners for the period from 1961 to 1980.

3. The levels of tariff protection (nominal and effective rates) afforded the sugar refining industry have been high. Accordingly, the volume of imports of refined sugar into Canada have been small between 1960 and 1978. The year by year changes in the levels of effective tariff protection afforded the refining industry are not significantly related to the year by year changes in the levels of profit rates. The most probable explanations for the lack of relationship between these variables are that other barriers to entry (dumping duties and the conduct of Canadian refiners to deny potential competitors access to raw and refined sugar on the world market and to the Canadian market for refined sugar) may be substantial. Additionally, it seems that the high levels of profit rates are attributable to the high

levels of concentration in this industry and extensive vertical integration between suppliers of raw sugar to Canada, raw sugar brokers and established Canadian refiners.

4. The standard deviations and the coefficients of variations about the means of the market shares held by Atlantic, Redpath and St. Lawrence suggest that the relative market shares of each of these refiners were stable from 1940 to 1973, even though economic conditions in the industry changed substantially. With reference to the dominant firm price leadership and collusion models and empirical studies discussed in Chapter IV (Cohen and Cyert, 1975; Osborne, 1976; Spence, 1978; and Porter and Caves, 1978) it seems that eastern Canadian sugar refiners applied a quota rule as an efficient way of deterring off-list pricing and maintaining stable market shares. It is therefore concluded that the observed stability of market shares was symptomatic of a highly developed degree of collusion in the eastern Canadian sugar refining market.
5. Estimates of social costs (deadweight social costs, costs due to lags in adopting improved technologies and excess capacity) and of the transfer of incomes from consumers to refiners due to exertion of market power in the sugar refining industry are substantial. Estimates of the total losses in consumer surplus in 1975 range from about $36 million to $176 million (expressed in

1980 dollars). These estimates are equivalent to a price rise which ranges from $1.63 to $8.00 per 100 pounds of refined sugar. The corresponding losses in 1977 are estimated to be from about $12 milllion to $57 million dollars (expressed in 1980 dollars). These estimates are equivalent to a price rise which ranges from $0.48 to $2.31 per 100 pounds of refined sugar. Even though these results have to be viewed with caution, they provide a strong indication that there is a need for a more effective Canadian competition policy.

D. The Methods and Organization of the Study

The analysis of the Canadian sugar refining industry uses two sets of secondary data. As noted earlier, one set is obtained from pleadings before the trial court, the court of appeal and the Supreme Court of Canada concerning the *Atlantic Sugar* case.[11] This information was gathered by the Bureau of Competition Policy between 1967 and 1975. These data consist of written documents (letters, minutes, reports) collected from files of these sugar refiners, and from several records of private and Government organizations. The oral evidence which was recorded during the hearings consists of replies given to the counsel for the Crown. These included replies by Atlantic, Redpath and St. Lawrence, users of refined sugar in eastern Canada, suppliers of raw sugar to Canada, and various other parties who were concerned about the market conduct of the sugar refiners. These replies were given under oath in response to questioning of the counsel. Thus, these replies and documents are assumed to be an accurate record of events in the refining industry. All these documents and recorded replies have been compiled in fifty two volumes. Reference to these documents in this study indicates the number of the volume in which the transcripts are filed and the page. The citation also indicates the name of the court for which the evidence is filed. This is necessary because there are differences in the numbering of the documents for each of the trial court, court of appeal and the Supreme Court of Canada.

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[11] The refiners involved were Atlantic, Redpath and St. Lawrence. These transcripts before the courts are located in the Department of Consumer and Corporate Affairs, Bureau of Competition Policy, of the Government of Canada, Ottawa.

The second set of data was from a number of published sources. These are cited in the subsequent chapters. A word should be said about the official statistics on which this study is partly based. Official data at the firm level are not plentiful in Canada. This is probably due to the fact that in most industries the number of firms is small, a circumstance which makes firms more cautious about providing statistics to the public. Further, under the Official Secrets Act, official statistics do not divulge to the public detailed information about single firm's operations. Thus, most official statistics are aggregated.

Different methods of analysis are used in this study. These include the use of econometric models, correlation coefficient analysis, descriptive analysis and graphical illustrations.

Subsequent chapters of this study are organized in the following way: Chapter II provides some background information on the industry. First, a review of the development of the industry is given. Second, the supply of and demand for sugar in Canada is considered. Third, the contribution of the refining industry to the Canadian economy is outlined. The last part of Chapter II is a brief overview of the anticombines regulations and the effect of the regulations on the level of competition and performance of the industry. Chapter III contains an analysis of the market structure of the refining industry. The specific features assessed are market concentration, vertical integration, economies of scale and tariff protection. Chapter IV presents an assessment of some features of market conduct of the industry as revealed by evidence from the *Atlantic Sugar* case. Three specific features of market conduct are examined. The first feature relates to allegations of market sharing by Atlantic, Redpath and St. Lawrence (the three major sugar refiners in eastern Canada). The second concerns exclusionary tactics adopted by existing refiners to deter potential competitors from entry into the market for refined sugar. The third is concerned with procedures for pricing refined sugar by the Canadian refiners. Chapter V is a review of some economic theories and empirical studies related to the measurement of allocative efficiency. Chapter VI consists of an assessment of market performance using different concepts of allocative efficiency introduced in Chapter V. The level of technical efficiency in the refining industry is inferred from a comparison between the total average costs of the smallest optimum plant size and of the existing plant sizes (a topic previously discussed in Chapter III). Some evidence on technical efficiency is also inferred from the level of utilization of plant capacity in the refining industry. Allocative efficiency is assessed by determining the relationships between prices for sugar at the world, wholesale and retail market levels. This also involves an assessment of the relationships between retail prices in different markets in Canada. The level of profit rates in the Canadian sugar refining industry is compared to the level of profit rates in the cane sugar refining industry in the United States. A final measure of losses in economic efficiency involves an estimation of the social costs and income transfer effects of exertion of market power in the Canadian sugar refining industry. The last chapter presents a summary, the conclusions and the recommendations of the study.

II. AN OVERVIEW OF THE SUGAR REFINING INDUSTRY IN CANADA

A number of factors appear to have had an impact on the current state of competition in and performance of the Canadian sugar refining industry. The first of these is the historical development of the sugar refining industry. The second is the nature of the world market which supplies sugar to Canada. The third factor is the nature and size of the market for refined sugar in Canada. Fourth are the policies of the Government of Canada, particularly competition and tariff protection policies which affect the industrial and service sectors in general, and the sugar refining industry in particular. The purpose of this chapter is to provide an overview that describes the setting for the assessment of the economic performance of the Canadian sugar refining industry. In addition, a brief outline of the contributions of the industry to the Canadian economy from 1960 to 1978 is presented.

A. The Historical Development of the Sugar Refining Industry in Canada

A number of sources are excellent references giving detail on the historical development of the Canadian sugar refining industry. Only a brief overview is provided here.[1]

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[1] For those wishing for more details, see Canada, Dept. of Justice, Restrictive Trade Practices Commission, *op. cit.*, (1957), 1-3, 11-14, 42-44, 133-162; *Idem*, (1960), 5-9, 255-261; Food Prices Review Board, *op. cit.*, (1975), 5-8; and Canada and Dominion Sugar Company, *One Hundred Years of Progress 1854-1954* (Montreal: Gazette Printing, 1954).

The first successful cane sugar refining plant in Canada was established in 1854 in Montreal by Canada Sugar (now Redpath). Between 1854 and 1878 a number of cane sugar refineries were built in the Maritime provinces, but, due to competition from imported refined sugar, all the plants were later closed. In 1879 the customs duty levied on imports of refined sugar was substantially increased[2] and in response, in the same year, St. Lawrence built a cane sugar refinery in Montreal. Eleven years later (in 1890) B.C. Sugar built a cane sugar refinery in Vancouver. In 1893 the Acadia Sugar Refining Company built a refining plant at Dartmouth, Nova Scotia. A fifth cane sugar refinery was built by Atlantic in St. John, New Brunswick, in 1912. These five initial sugar refiners have dominated the refining of sugar in Canada till now. The Restrictive Trade Practices Commission (1960) reported that in the early 1930s, Crosse and Blackwell (Canada), a food processor, established a sugar refinery in Toronto. It is worth noting that this refiner was later acquired by Atlantic, Redpath and St. Lawrence in 1936 in the proportions of 35.5, 43 and 21.5 percent, repectively.[3] Between 1930 and 1964, no new refiner entered the cane sugar refining industry.

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[2] In 1879 import duties levied on many commodities were substantially increased. The levels of customs duties have remained generally high since 1879. See C. Green, *op. cit.*, (1980), 161.

[3] Canada, Dept. of Justice, Restrictive Trade Practices Commission, *op. cit.*, (1960), 260. These percentages are the same as the percentage market shares held by Atlantic, Redpath and St. Lawrence of the total market for refined sugar in eastern Canada from 1940 to 1973, see Chapter IV.

The Restrictive Trade Practices Commission has reported that between 1881 and 1902 several unsuccessful attempts were made to start sugar beet industries in Quebec, Ontario and Alberta.[4] The first successful beet sugar refineries (four of them) were built in Ontario in 1902, and in 1909 the Dominion Sugar Company was formed to operate these beet sugar refineries. This company built another beet sugar plant at Chatham in 1916.[5] Meanwhile, in 1913, Canadian Sugar Factories built a beet sugar refinery at Raymond, Alberta. In 1925, Manitoba Sugar was incorporated. It constructed a sugar refinery at Fort Garry in 1940. In 1936 and 1950, B.C. Sugar built two beet sugar refineries in Alberta at Picture Butte and Taber, respectively. The last established beet sugar refinery in Canada was built by the Government of Quebec at St. Hilaire during the second world war. This is the only beet sugar refinery that is still operating in eastern Canada.

Between 1930 and 1960, the development of the sugar refining industry in Canada was characterised by mergers. In 1930, Canada Sugar (a cane sugar refiner) merged with Dominion Sugar (predominantly a beet sugar processor) to form Canada and Dominion Sugar (now Redpath). Since the merger, this company has been the dominant sugar refiner in Canada. Canada and Dominion was then acquired by Tate and Lyle Limited of London (hereafter referred to as Tate and

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[4] *Ibid.*, (1957), 11.

[5] All beet sugar plants in Ontario have been closed.

Lyle) in 1959.[6] The impact of that acquisition on the performance of the sugar refining industry in Canada is discussed in Chapters III and IV.

A year after the merger which formed the Canada and Dominion Sugar Company (now Redpath), B.C. Sugar acquired the Canadian Sugar Factories Company which operated the beet sugar refinery at Raymond, Alberta. In 1955, B.C. Sugar also acquired Manitoba Sugar with its beet sugar refinery at Fort Garry. Meanwhile, between 1934 and 1936, the Crosse and Blackwell Sugar Refinery, which had been established in the early 1930s, was acquired by Beamish Sugar Refineries. In 1936, Canada and Dominion, together with Atlantic and St. Lawrence jointly acquired Beamish Sugar. The sugar refinery of Beamish Sugar was then closed in 1942.

In 1939, Atlantic Sugar and Acadia Sugar merged to form Acadia-Atlantic Sugar.[7] Three years after the merger, Acadia-Atlantic closed the cane sugar refinery at Dartmouth. The company has retained its cane sugar plant in St. John, New Brunswick till now. The merger created a monopoly in the Maritime provinces. In addition, the company became the third largest sugar refiner in Canada, after Redpath and B.C. Sugar. By 1960, the number of sugar refiners had been reduced to five, though the number of refining plants had increased to twelve. The names of these refiners and the locations of the refining plants in Canada in 1980 are shown in Table II-1 and Figure II-1.

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[6] Tate and Lyle is a British multinational company which is involved in the production of sugar cane and raw and refined sugar in many parts of the world. It is the dominant sugar refiner in Britain.

[7] Acadia-Atlantic Sugar changed its name to Atlantic Sugar Refineries in 1963.

The factors which encouraged mergers in the sugar refining industry are not well known. As discussed in Chapter III, it is most probable that the apparently moderate economies of scale encouraged some of the merger activities for very small firms. It may be that some of the sugar refiners desired to achieve market dominance in the industry. Whatever the reasons, the merger activities contributed to the high level of concentration in the Canadian sugar refining industry.

B. Supply of Sugar in Canada

Table II-2 and Appendix II-1 show some principal statistics of the production, trade and consumption of sugar in Canada. The total production of refined sugar in Canada increased from one year to another from 1960 to 1978 (except for 1974 and 1975 when the production of refined sugar declined). The total production of refined sugar in 1960 was 774 thousand tons. The production had increased to 1,140 thousand tons by 1978, an increase of 47 percent over this period of time. The total shipments of refined sugar in 1960 and 1978 were 748 and 1,162 thousand tons, respectively. The total value of shipments of refined sugar in 1960 was $124 million. By 1978 the value of shipments had increased to $444 million.

TABLE II-1

Names of Sugar Refiners and Locations of Sugar Refining Plants in Canada in 1978

Name of sugar refiner	Location of refining plant	Name of the parent company
Atlantic Sugar	St. John	Jannock Corporation
British Columbia Sugar	Vancouver	British Columbia Sugar Refinery
Canadian Sugar	Taber	"
Manitoba Sugar	Fort Garry	"
Cartier Sugar	Montreal	Steinberg's
Quebec Sugar	St. Hilaire	Government of Quebec
Redpath Sugar	Montreal	Redpath Industries
	Toronto	Redpath Industries
St. Lawrence Sugar	Montreal	Sucronel
Westcane Sugar	Oshawa	George Weston

SOURCE: Canada, Statistics Canada, *Cane and Beet Sugar Processors*, Cat. 32-222 (Ottawa: 1980).

NOTES: Redpath closed its sugar refinery in Montreal in 1980.

TABLE II-2

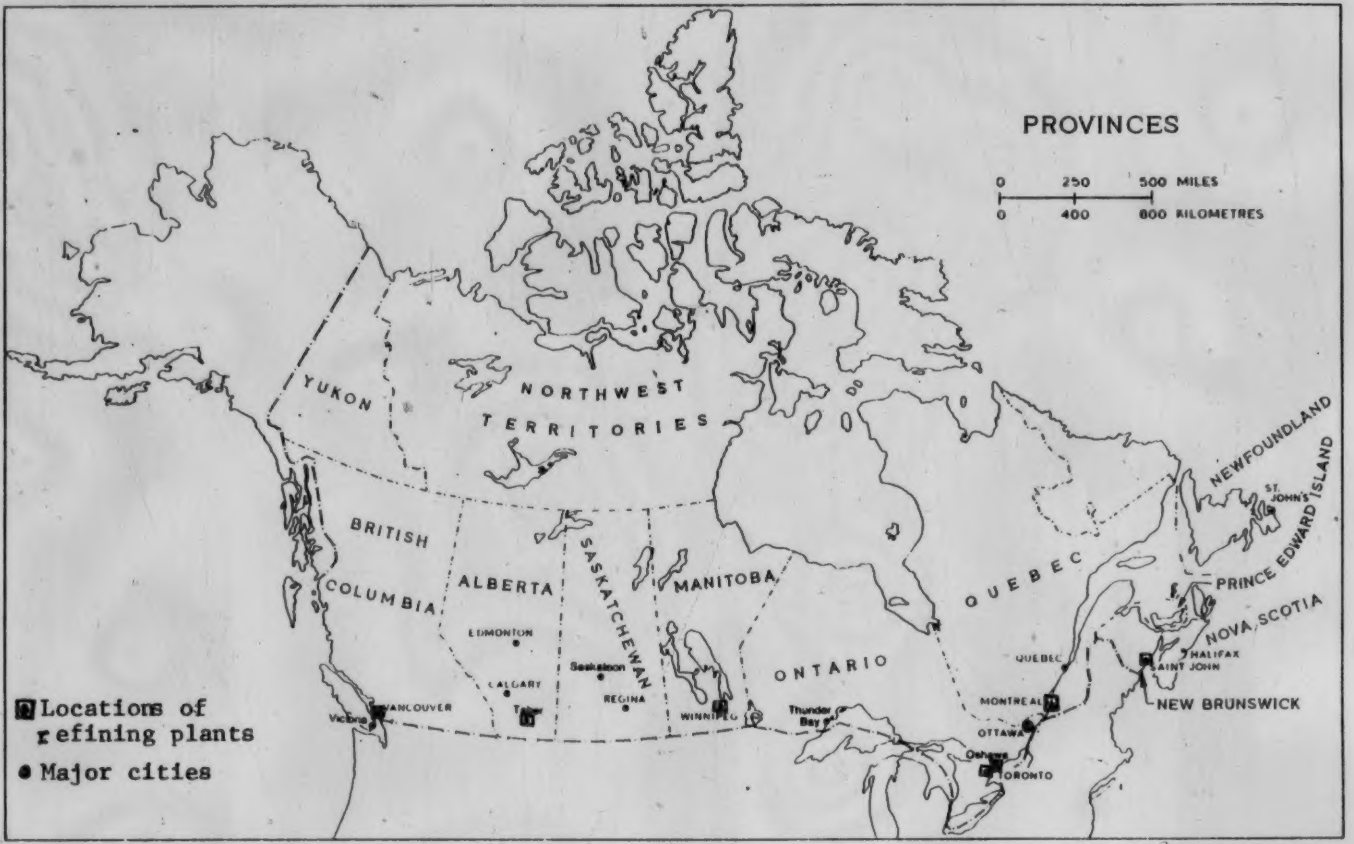
Principal Statistics on Sugar in Canada, for Selected Years, 1960 to 1978

Activity	1960	1965	1970	1975	1978
Production of refined sugar:					
Total production (1000 tons)	774	886	1005	943	1140
Total shipments (1000 tons)	748	690	1007	984	1162
Value of shipments ($ million)	124	147	204	733	444
Value-added ($ million)	44	52	70	108	114
Total number of employees	2213	3292	2967	2780	2878
Total payroll ($ million)	14	17	22	35	47
Trade:					
Imports, raw sugar (1000 tons)	668	916	1043	1037	1118
Imports, raw sugar ($ million)	51	55	85	459	118
Imports, refined sugar (1000 tons)	0.3	0.6	0.6	5.0	1.0
Exports, refined sugar (1000 tons)	3.0	16.6	13.4	79.0	121
Consumption:					
Total (1000 tons)	742	854	995	931	1032
Per capita (pounds per year)	94	97	99	88	92
Market Structure:					
Number of refiners	5	6	6	7	7
Number of refining plants	12	12	10	10	10

SOURCES: Canada, Statistics Canada, *Cane and Beet Sugar Processors*, Cat. 32-222 (various issues, 1960 to 1978); and International Sugar Organization, *Sugar Yearbook*, (London: Various issues, 1960 to 1978).

FIGURE II-1

Locations of Sugar Refining Plants and Major Cities in Canada, 1980


PROVINCES
0 250 500 MILES
0 400 800 KILOMETRES
YUKON
NORTHWEST TERRITORIES
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
PRINCE EDWARD ISLAND
NOVA SCOTIA
NEW BRUNSWICK
ST. JOHN'S
HALIFAX
SAINT JOHN
QUEBEC
MONTREAL
OTTAWA
Oshawa
TORONTO
Thunder Bay
WINNIPEG
REGINA
Saskatoon
EDMONTON
CALGARY
Taber
VANCOUVER
Victoria
Locations of refining plants
Major cities

SOURCE: The Committee for the World Atlas of Agriculture (Ed.), World Atlas of Agriculture (Novara: Instituto Geographico De Agostini, 1970), 135.

Table II-3 summarizes the total industry expenditures on the major variable inputs in the refining of sugar in Canada. The two main inputs in the refining of sugar in Canada have been raw sugar and sugar beets which have accounted for 76 to 90 percent of the total cost of variable inputs. Other inputs (labor, chemicals, fuel and other materials) account for the remainder of the costs. About 84 to 90 percent of all sugar processed in Canada has been from imported raw cane sugar.[8] As is shown in Table II-2, only a very small volume of refined sugar is imported into Canada. The remaining 10 to 16 percent of sugar consumed annually in Canada is obtained from domestic sugar beets. These sugar beets are produced in the provinces of Alberta, Manitoba and Quebec.

In view of Canada's dependence on imports of sugar for the main part of her supplies, a brief review of the world market for sugar pertinent to Canada is presented.[9] The proportion of total world sugar production which moved in international trade each year (for 1960 to 1978) averaged 30 percent, representing about 20 to 22 million tons. About 60 percent of this sugar (about 13 million tons) was traded under special arrangements. Under these arrangements, prices and quantities of sugar traded are negotiated between

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[8] Canada, Statistic Canada, *Cane and Beet Sugar Processors*, Cat. 32-222, (various issues); and Table II-2.

[9] For a more detailed discussion of various arrangements in the international sugar market, see Food Prices Review Board, *op. cit.*, (July 1974), 3-19; and International Sugar Organization, *Sugar Yearbook* (London: 1964, 1970 and 1978 issues).

TABLE II-3

Costs of Major Variable Inputs in the Refining of Sugar in Canada, for Selected Years, 1960 to 1978

Year	raw sugar & sugar beets	wages	Fuel & electric. operating maintenence & repairs	Total material & supplies	Raw sugar & sugar beets as a % of variable costs
	------ million of dollars-----				
1960	67	10	5	91	77
1965	68	11	6	95	76
1970	100	16	7	133	77
1975	563*	24	13	599	89*
1978	290*	32	21	324	78*

SOURCE: Canada, Statistics Canada, *Cane and Beet Sugar Processors*, Cat. 32-222 32-222 (various issues).

NOTES: * These figures refer to raw sugar only since data on the value of sugar beets are not readily available for these years.

exporting and importing countries. These arrangements have tended to assure relatively stable prices for and quantities of sugar traded between the countries concerned.

Over recent years (1974 to 1978) the balance of sugar traded (about 7 million tons) took place on the world free market. This market comprises all international transactions outside the special arrangements. The main market for the "free" sugar is the London Sugar Terminal market. Prices of sugar on this market appreciably respond to changes in the quantities of sugar supplied and demanded in the world. Canadian imports of sugar are from the world free market. Thus, sugar prices in Canada likely have fluctuated in response to changes in the prices for sugar on this market.[18]

C. Demand for Refined Sugar in Canada

The growth in the total annual demand for refined sugar in Canada between 1960 and 1978 has been slow. As shown in Table II-2 and Appendix II-1, the annual total consumption of refined sugar in 1960 was 742 thousand tons and had increased to 1,032 thousand tons by 1978. This represented an annual average growth rate of about 2.1 percent over this period of time.

The annual average per capita consumption of refined sugar in Canada between 1960 and 1978 was some 96 pounds. Over this period of time, the lowest and highest annual average per capita consumption was about 88 and 104 pounds of refined sugar in 1975 and 1973, respectively. Overall, between 1960 and 1978, annual per capita consumption of refined sugar tended to be stable.

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[18] Sugar prices on the world free market have been substantially influenced by the International Sugar Agreement whenever this has been operative. Under the terms of that agreement, the volume of sugar traded on the world free sugar market is regulated such that sugar prices are supposed to fluctuate within predetermined price ranges. For the details of this agreement, see *Idem*, The International Sugar Agreement (London: 1977).

Sugar appears to be regarded by consumers in Canada as a necessary item. Hassan and Johnson (1976) estimated the price elasticity of demand and income elasticity for sugar in Canada in 1976 to be -0.085 and 0.1175, respectively.[11] Huff and others (1981) also reported that the total per capita expenditure on sugar in Canada has been 0.96 percent of the total per capita expenditure on all goods and services in Canada.

Another characteristic feature of refined sugar products is that the extent of product differentiation and substitution is limited. The different forms of cane and beet sugar, which include granulated, icing, brown, yellow, cube and liquid sugar, are similar for all refiners except for the limited differences in the packaging. Artificial and natural non-sugar sweeteners which include cyclamates, aspartame, honey, maple sugar and syrups have been of minor importance as sweeteners relative to the cane and beet sugars in Canada. Agriculture Canada (1980) has reported that the per capita domestic disappearance of non-sugar sweeteners between 1960 and 1974 was only about 10 percent of the total per capita disappearance of all sweeteners in Canada.[12] From 1974 to 1979, consumption declined to about 3 percent of the total domestic disappearance of sugar in Canada. In general, it seems that there have been few substitutes to cane and beet sugar products in Canada.

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[11] Huff and others (1980) have reported estimates of price elasticity of demand and income elasticity for sugar in Canada of -0.054 and 0.227, respectively. These values seem to differ markedly from those reported by Hassan and Johnson in 1976. Nevertheless, both sets of estimates indicate that refined sugar is price and income inelastic. See Z.A. Hassan and S.R. Johnnson, *Consumer Demand for Major Foods in Canada* (Ottawa: Econ. Res. Publ. No. 76/2, 1976), 37-38; and Bruce Huff, John Graham and Ralph Lattimore, "The Canadian Component of the International Commodity Model", paper presented at the Agrologists Institute of Canada, Annual Meeting, St Catherines, Ontario, Aug. 1981, 7.

The situation of limited substitutes to cane and beet sugar products may change in the future, at least with respect to the industrial user market. Agriculture Canada (1981) has reported that three high fructose sweetener plants in eastern Canada will be fully operational by late 1982.[13] This report suggested that, by the end of 1981, the high fructose sweeteners would account for about 16 percent of the total disappearance of sweeteners in Canada, compared to less than 1 percent before 1979. It was also noted that aspartame, a new low caloric artificial sweetener, could in the future become an important substitute for cane and beet sugar products.

The likely extent of market competition between the cane and beet sugar products and the high fructose sweeteners is difficult to estimate. However, considering that Redpath Industries has entered the high fructose sweetener industry, it is not probable that the level of market competition provided by the high fructose corn sweetener industry will increase substantially.[14] Expansion of existing refiners into the non-sugar sweetener industry would be expected to limit the extent of market competition between the two industries.

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[12] Canada, Agriculture Canada, *Handbook of Food Expenditures, Prices and Consumption* (Ottawa: Economics Research Branch 80/4, 1975), 47 and (1980), 47.

[13] Canada, Agriculture Canada, *Market Commentary: Horticulture and Special Crops* (Ottawa: Dec. 1981), 46; (Dec. 1980), 36; and (Dec. 1979), 33.

Refined sugar in Canada is distributed through two distinct markets: the industrial user market and the direct consumption user market. As shown in Appendix II-1, in the 1970s, about 60 percent of all refined sugar in Canada was for industrial use.[15] The main industrial users of refined sugar are manufacturers of soft drinks, wine, bakeries, confectioneries, and canners and preservers of fruits and vegetables. The balance of the refined sugar is distributed through wholesalers and retailers to households and institutions.

Another feature of demand which may have affected the structure and performance of the Canadian sugar refining industry is the total population and its distribution over a large land surface. The market size (total population) for refined sugar in Canada is small relative to the market in the United States. The total population in Canada in 1960 and 1980 was 18 and 24 million, respectively.[14] It is estimated from the annual total population data that the annual rate of population growth in the 1970s was about 1.1 percent.

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[14] Redpath Industries and Labatt Ltd. jointly own Zymaize Company and operate a plant for the production of high fructose corn sweeteners. A spokesman for Redpath Industries has predicted that these products will account for 20 to 30 percent of the total national market for all sweeteners in Canada in the next 5 years. The spokesman has also forecasted that Redpath will have a substantial share of the market for high fructose sweetener in Canada. See "Leap in Redpath sales predicted to even out," *The Globe and Mail*, 18 February 1980, B24.

[15] Canada, Statistics Canada, *Cane and Beet Sugar Processors*, Cat. 32-222, (various issues 1960-1979).

In general, the distribution of the population in Canada is on an east-west pattern along the southern part of Canada, though a large proportion of the population is located in Quebec and Ontario. Between 1960 and 1980, the population of these two provinces constituted about 60 percent of the total population in Canada. Most of this population is located in and around Montreal and Toronto.

The distribution of the population is likely to have had an impact on the location of sugar refineries near major population centres. The distribution of the population over a large land area implies that transportation costs of sugar--a bulky and relatively low priced item--could be a major component of the total price for sugar. The feature of relatively high transportation costs for sugar can limit the extent of market competition in the refining industry since it may contribute to local monopolies.

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[14] Canada, Agriculture Canada, *Handbook of Food Expenditures, Prices and Consumption* (Ottawa: Economics Research Branch 80/4, 1980), 3.

D. Economic Contribution of the Sugar Refining Industry to the Canadian Economy

Data published by Statistics Canada (1971) indicate that from 1971 to 1978, the total value of refined sugar output at the plant levels was an average of 0.13 percent of the total value of output of all Canadian industries.[17] This was an average of 2.3 percent of the total output of the food and beverage manufacturing industries. Though the contribution of the refining industry to the total economy may appear to be relatively small, the product of the industry is important to the food processing sector. About 60 percent of the sugar refined in Canada is used in the industrial sector, mainly as an intermediate input in the the manufacture of food.

As shown Appendix II-1, the number of workers employed in this industry has remained fairly stable, with a slight decline over the last twenty years. The number of workers in 1960 was 3213 and by 1978 it was 2878, a marginal decline of 11 percent over these years. The total labor earnings in this industry in 1960 were $14 million. By 1978, the total earnings were $47 million. Value-added in 1960 was $44 million. In 1978 the value-added was $114 million. In addition to the direct contributions of the refining industry to the economy, the industry contributes to the economic activity of other industries, particularly transportation and merchandising.

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[17] Canada, Statistics Canada, *Input-Output Structure of the Canadian Economy in Constant Prices, 1971-1978*, Cat. 15-202E (Ottawa: 1978).

E. The Canadian Combines Investigation Act

One of the main policies of the Government of Canada concerned directly with market stucture, conduct and performance of the industrial and service sectors is effected through the anticombines legislation. Through this legislation the Government of Canada has applied its policies to influence the market structure, conduct and performance of, among other industries, the sugar refining industry in Canada. In this section, a brief outline of the Canadian Combines Investigation Act is presented.

The Combines Investigation Act was enacted in 1889, a year before the United States passed its first antitrust law. The Act has undergone several revisions, though the stated objectives have remained basically the same.[18] The stated objectives are summarized as:

> The purpose of the Combines Investigation Act is to assist in maintaining effective competition as a prime stimulus to the achievement of maximum production, distribution and employment in a mixed system of public and private enterprises....
>
> Part V of the Act prohibits under criminal sanctions, cetain practices which may be generally classified as combinations to lessen competition, mergers and monopolies, specified trade practices, misleading advertising and deceptive marketing practices.[19]

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[18] The Combines Investigation Act is contained in Chapter C-23 of the Revised Statues, 1970. For a more detailed discussion of the development of this Act, see J. Ball, *Canadian Anti-Trust Legislation* (Baltimore: The Williams and Wilkins Co., 1934); G. Rosenbluth and H.G. Thornburn, *Canadian Anticombines Administration 1952-1960* (Toronto: Univer. of Toronto Press, 1963); and C. Green, *op. cit.*, (1980), Chapters 6-8; and W.T. Stanbury, "The Legislative Development of Canadian Competition Policy: 1888-1981," *2 Canadian Competition Policy Record* (1981).

[19] Canada, Dept. of Consumer and Corporate Affairs, *Annual Report, Director of Investigation and Research, Combines*

Under this law, offenders can be convicted only if the lessening of competition is undue, and enhancement of prices is unreasonable. That is, the undue and unreasonable enhancement practices have to be to the detriment of the public interest. In addition, this law requires the Crown to prove beyond reasonable doubt that these effects are intended. It has been indicated by Green (1980), Rosenbluth and Thornburn (1963) and Ball (1934), that the consequence of the generality of the terms undue, unreasonable and to the detriment of the public interest, is that enforcement of competition policy under the Combines Investigation Act has been rather limited.[20]

In 1971, after a comprehensive study by the Economic Council of Canada in 1969 on the effectiveness of the Combines Investigation Act, a bill was introduced in the Canadian Parliament with the objective of revising this Act. This bill was not passed. The bill was introduced again in Parliament in two stages. The "first stage" bill was introduced in 1973 and was concerned with those aspects of the 1971 bill upon which consensus appeared to have been reached.[21]

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[19](cont'd)*Investigation Act, March 1979* (Ottawa: 1979), 1-4.

[20] C. Green,*op. cit.*, (1980), 147, 186-199; G. Rosenbluth and H.G. Thornburn *op. cit.*, Chapters 7 and 9; and J Ball, *op. cit.*, Chapters 4 and 10.

[21] For a more detailed discussion of the first and second stage bills, see Canada, Dept. of Consumer and Corporate Affairs, *Proposals for a New Competition Policy for Canada, Second Stage* (Ottawa: 1977); W.T. Stanbury and G.B. Reschenthaler, "Reforming Canadian Competition Policy: Once More unto the Breach," *The Canadian Business Law Journal* 5

The revisions included giving the Restrictive Trade Practices Commission powers to issue prohibition orders in certain specified conditions, extending the Act to cover the service sector, introducing the consumer protection measures, and prohibiting bid rigging. This bill was passed in 1975.

The "second stage" bill, which was more controversial, was introduced in the Canadian Parliament in 1977. One of the proposed revisions to the anticombines law was to replace the Restrictive Trade Practices Commission by a semi-judicial Competition Board which could review certain matters assigned to it as well as issue corrective orders concerning mergers, monopolization, joint monopolization and foreign conspiracies. Another proposal was to include a new section to cover trade practices associated with delivered pricing and conscious parallelism. As was reported by Green (1980), the business community strongly opposed these proposals and till now the bill has not been passed.[22] Green argued that, in general, new amendments to the Combines Investigation Act are not likely to be very effective, unless the ambiguity of terms such as "undue", "unreasonable enhancement", and "detriment to the public interest" are defined with precision or deleted from the Act. The

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[21] (cont'd)(Sept. 1981); and *Idem*, "Recent Conspiracy Decisions in Canada: New Legislation Needed *The Antitrust Bulletin* (Winter 1981). C. Green, "Canadian Competition Policy at a Crossroads," *Canadian Public Policy* 7 (Summer 1981): 418-431.

[22] C. Green, *Op. cit.*, (1980), 168, 197-198.

application of the anticombines law to Atlantic, Redpath and St. Lawrence between 1975 and 1980 is discussed in Chapter IV.

III. MARKET STRUCTURE OF THE CANADIAN SUGAR REFINING INDUSTRY

This chapter examines some characteristics of market structure in the sugar refining industry in Canada for the period of time between 1960 and 1978. The levels of market concentration are outlined and the extent of vertical integration and of customs tariff protection are considered. An assessment of economies of scale in the refining industry is also undertaken. The objective is to aid in the evaluation of the impact which features of market structure have on conduct and performance of the sugar refining industry.[1] As pointed out by Green (1980), the relationship between market structure, conduct and performance is a major theme of industrial organization and is the subject of much empirical work and controversy.[2] Nevertheless, this model is useful in facilitating the examination of the relationships between market structure and industry conduct and performance.

A. Market Concentration in the Sugar Refining Industry

Economic theory and empirical studies suggest that high levels of concentration in an industry are associated with reduced levels of economic efficiency in those industries.[3]

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[1] The structure, conduct and perfomance model of industrial organization is discussed in various textbooks. For example, see J.S. Bain, *Industrial Organization* (New York: Wiley, 1959); F.M. Scherer, *op. cit.*; and C. Green, *op. cit.*, (1980).

[2] C. Green, *op. cit.*, (1980), 33-34.

[3] There is a vast literature on the relationship between features of market structure and performance. In general, economic theory and empirical results show a positive

In particular, high levels of prices (in excess of marginal costs) and profits (in excess of normal profits) which persist over long periods of time in industries with substantial market power are likely to be indicative of allocative inefficiency in the form of higher production costs and lower output levels. There are also social costs associated with suboptimal plant sizes and excess capacity, features which are often associated with high levels of concentration. Also, there are losses in consumer surplus which are associated with transfer of incomes from consumers to producers who exert market power. Moreover, it is postulated that high levels of market concentration are associated with lags in adoption of new technologies.[4] In general, the exertion of substantial market power tends to result in the loss of allocative and technical efficiency. The subject of losses in technical and alllocative efficiency is discussed more fully in Chapters V and VI.

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[3] (cont'd)association between market power and rates of profits. For a discussion of some findings, see N.R. Collins and L.E. Preston, *Concentration and Price-Cost Margins in Manufacturing Industries* (Berkeley: University of California Press, 1968), 18-50; L. Weiss, "Quantitative Studies in Industrial Organization," in M.D. Intriligator (ed.) *Frontiers of Quantitative Economics* (Amsterdam: North Holland Publ., 1971), 362-403; *Idem*, "The Concentration-Profit Relationship and Antitrust," in H.C. Goldschmid et al., *Industrial Concentration: The New Learning* (Boston: Little Brown, 1974), 184-233; D. MacFetridge, "Market Structure and Price Cost Margins: An Analysis of the Canadian Manufacturing Sector," *Canadian J. of Economics* 6 (Aug. 1973): 344-355; and C. Green, *op. cit.*, (1980), Chapters 2 and 6.

[4] For a more detailed presentation, see H. Leibenstein, "Allocative Efficiency vs 'X-inefficiency'," *American Economic Review* 16 (June 1966): 392-415.

The numbers of sugar refiners and of refining plants in Canada for selected years between 1960 and 1980 are shown in Table III-1 (also in Table II-1). Table III-2 shows the market shares of the largest three and four refiners in Canada from between 1961 and 1973. The largest four sugar refiners in Canada have always been Redpath, B.C. Sugar, Atlantic and St. Lawrence.[5] In 1961, these four firms controlled 98.6 percent of the total quantity of shipments of refined sugar in Canada. Their total shares of the market declined slightly with the entry of Cartier Sugar Refinery (hereafter referred to as Cartier) in 1964. By 1968, the largest four firms controlled 92.7 percent of the national sugar market. Redpath, Atlantic and St. Lawrence which have their refineries in eastern Canada controlled 77.1 percent of the total shipments of refined sugar in Canada in 1961. Their market shares had declined to 71.7 percent in 1969. (Cartier achieved about 6 percent of the total market for refined sugar in Canada). In 1974, Westcane Sugar Company (hereafter referred to as Westcane) entered into the refining industry. The entry of Westcane can be expected to have increased market competition in the refining industry.

As will be shown in Chapter IV, the relative shares of the market controlled by each of the three largest sugar refiners in eastern Canada remained fairly constant from 1961 to 1973. This stability in market shares is not likely

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[5] *The Queen v Atlantic Sugar Refineries et al.* (1980), Pleadings before the Supreme Court of Canada, 35, 7064-65; 47, 9740; and Food Prices Review Board, *op. cit.*, (1975), 6.

TABLE III-1

The Number of Sugar Refiners and Refining Plants in Canada, for Selected Years, 1960 to 1980

Year	Number of sugar refiners	Number of refining plants
1960	5	12
1965	6	12
1970	6	10
1975	7	10
1980	7	9

SOURCE: Canada, Statistics Canada, *Cane and Beet Sugar Processors*, Cat. 32-222 (various issues).

NOTES: The figures in this table refer to sugar refineries which are actively refining cane and beet sugar.

TABLE III-2

Concentration Ratios in the Sugar Refining Industry in Canada, 1961 to 1973

	Percentage share of the market for sugar in:		
	------Canada------		----eastern Canada--
Year	Largest 4 refiners in Canada (1)	Largest 3 refiners eastern Canada (2)	Largest 3 refiners in eastern Canada (1)
1961	98.6	77.1	98.2
1962	98.5	77.5	98.1
1963	98.3	77.1	98.0
1964	97.9	76.6	97.3
1965	94.0	73.6	92.2
1966	93.4	74.7	92.2
1967	93.4	73.4	91.9
1968	92.7	72.3	90.4
1969		71.7	
1970		72.7	
1971		72.0	
1972		73.4	
1973		74.0	

SOURCE: (1)*The Queen v Atlantic Sugar Refineries, et al.*, (1978), Pleadings before the court of appeal, Montreal, 32, 6396-97; and (2)*Idem*, (1980) Pleadings before the Supreme Court of Canada, 35, 7064-65; 47, 9400.

NOTES: The largest four refiners in Canada are Redpath, Atlantic, St. Lawrence and B.C. Sugar. The first three refiners are the largest in eastern Canada.

TABLE III-3

Concentration Ratios in the Sugar Refining Industry in Canada, by Provinces, 1963 to 1968

Region and Sugar refiner	Percentage shares of the sugar market in eastern Canada					
	1963	1964	1965	1966	1967	1968
Ontario:						
Redpath	50	53	51	47	49	49
Atlantic	31	29	28	31	30	28
St. Lawrence	19	18	21	22	19	21
Cartier		0	0	0	2	2
Quebec:						
Redpath	40	37	36	36	35	33
Atlantic	29	30	28	24	27	27
St. Lawrence	31	30	22	26	25	25
Cartier		3	14	14	13	15
Maritimes:						
Redpath	12	12	11	10	10	10
Atlantic	89	82	85	85	85	85
St. Lawrence	2	5	3	3	3	3
Cartier		0	1	2	2	2

SOURCE: *The Queen v Atlantic Sugar Refineries et al.*, (1976), A draft statement of evidence for the trial court, Montreal, 117.

NOTES: In 1963, Cartier had not started refining sugar.

to have changed since that time. It is argued later that the stability of market shares appears to be associated with lessening of competition in the eastern Canadian market for refined sugar.

As shown in Table III-3, from 1963 to 1968, the market shares of individual refiners in each province remained fairly constant. This situation may well be unchanged even now. The sugar market in Ontario has been dominated by Redpath. From 1963 to 1968, this refiner controlled, on average, about 50 percent of the total shipments of sugar in that province. Atlantic, St. Lawrence and Cartier controlled, on average, about 29, 20 and 1 percent of the market in Ontario, respectively.

Over the same period of time (1963 to 1968) the market for refined sugar in Quebec was not substantially dominated by a single refiner, unlike the situation in all other provinces in Canada. Between 1960 and 1968, Atlantic controlled, on average, 85 percent of the market for refined sugar in the Maritime provinces. As was discussed in Chapter II, from about 1960, B.C. Sugar has been the sole firm refining and marketing sugar in western Canada.

The quantity of imports of refined sugar into Canada has been negligible for the past 20 years (Table II-2). Though there was potential for competition in the market for refined sugar in Canada from imports of refined sugar, it would seem that competition in the refining industry was limited on national and regional levels.

The sugar refining industry in Canada has also been highly concentrated relative to other manufacturing industries in Canada. The Department of Consumer and Corporate Affairs (1971) ranked 154 manufacturing industries in Canada according to the level of market concentration.[6] The sugar refining industry was ranked as the 23rd most concentrated industry. It was also shown that the sugar refining industry was highly concentrated in Canada relative to the sugar refining industry in the United States.[7] The largest eight sugar refiners in Canada and the United States accounted for 100 and 47 percent, respectively, of the total national shipments of refined sugar in 1963 and 1965. It is worthy of note that the difference in market sizes in the two countries probably accounts for part of this difference in the levels of market concentration. As noted later in this chapter, the high levels of concentration in the Canadian sugar refining industry do not appear to be justified by economies of large scale at the plant level.

Economic theory of perfect competition and some of the empirical studies cited earlier in this chapter suggest that high levels of market concentration such as those in the refining industry are indicative of substantial market power. In particular, levels of profits are likely to be high over extended periods of time. Suboptimal plant sizes, excess plant capacity and x-inefficiency are likely to exist.

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[6] Canada, Dept. of Consumer and Corparate Affairs, *Concentration in the Manufacturing Industries in Canada* (Ottawa: Queen's Printers, 1971), 206.

[7] *Ibid.*, 211; and Robert Bohall *et al.*, *The Sugar Industry Structure, Pricing and Performance* (Washington D.C: Economic Research Service, Agriculture Economic Report No. 364, 1977), 8.

B. Vertical Integration in the Sugar Refining Industry in Canada

Vertical integration can be defined as the extent to which a firm controls successive stages in the process of production of a particular good or service. Vertical integration can be achieved through ownership, formal contracts, or informal agreements of understanding between firms. Scherer (1970) discussed some of the main economic implications of vertical integration for competition and performance.[8] In general, vertical integration can facilitate the control of the economic environment of a firm. This control can reduce uncertainty and costs of the firm concerned. Vertical integration can be an important feature of market structure, conduct and performance. Caves and Porter (1977) noted that through vertical integration, firms in one industry can enter other closely related industries more easily than those that are not vertically integrated.[9] In such a case, vertical integration can be viewed as promoting competition, especially when direct entry is considered to be difficult.

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[8] For a detailed discusion of the economic impact of vertical integration on competition and performance, see F.M. Scherer, *op. cit.*, 70-71; and I.Bernhardt, "Vertical Integration and Demand Variability," *Journal of Industrial Economics* 25 (March 1977): 213-229.

[9] R.E. Caves and M.E. Porter, "From Entry Barriers to Mobility Barriers," *Quarterly Journal of Economics* (1977): 241-262.

Conversely, competition is lessened by vertical integration when independent firms are denied access to vital goods and services by the vertically integrated firms. Thus, the impact of vertical integration on market competition and performance can be expected to vary from case to case.

The extent of vertical integration in the sugar refining industry in Canada appears to have increased substantially in the last twenty years. Between 1959 and 1960, Tate and Lyle acquired the control of Canada and Dominion (now Redpath). Evidence from court transcripts of the *Atlantic Sugar* case shows that Tate and Lyle has been involved in the production of sugar cane and raw and refined sugar in many countries of the world.[10] These countries have included Britain, the West Indies, Mauritius, South Africa, Rhodesia, Zambia and Nigeria. The evidence suggests that in the 1960s, the London daily price of raw sugar was based on the prices at which Tate and Lyle purchased raw sugar in Britain.[11] Also, as is discussed in Chapter IV, wholesale prices for refined sugar in Canada are based on the London daily price. The adoption (by Redpath) of the London daily price as the basis of pricing sugar in Canada immediately after Tate and Lyle acquired Redpath suggests an influence by Tate and Lyle on the level of prices of sugar in Canada. As discussed in Chapter IV, it seems that Tate and Lyle played a key role in preventing potential refiners and importers of sugar in Canada from having access to raw and refined sugar on the world market.

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[10] *Atlantic Sugar Refineries et al. v The Attorney General of Canada* (1980), Pleadings before the Supreme Court of Canada, 53, 10660-63, 10803-05.

[11] For a detailed discusion of this topic, see Chapter IV of this study.

Backward vertical integration occurred with the entry of Cartier and Westcane into the Canadian sugar refining industry in 1964 and 1974. In both cases the entry of these refiners was likely facilitated by their control of distribution channels for refined sugar.[12] As noted earlier, in the 1970s, Cartier and Westcane had a total market share of about 14 to 17 percent of the national market for refined sugar. Most of the sugar manufactured by these refiners is used or distributed by subsidiaries of the parent companies. It is difficult to assess the effect of these two instances of vertical integration on competition and performance in the sugar refining industry.

There is another example of vertical integration in the sugar refining industry which may have less impact on market conduct and performance of the refining sector. This involves the contractual arrangements which apply between sugar beet producers and beet sugar processors. The terms of these contracts state the number of acres of sugar beets to be grown, the services provided by the refiners to the producers and the formula on which the producers' sales receipts are based.[13] It is probable that the contractual arrangement has assured a stable supply of sugar beets to the refiners.

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[12] These companies (Cartier and Westcane) are subsidiaries of Steinberg and George Weston, respectively. Steinberg and George Weston are major Canadian food processing and merchandising firms. For some details on the corporate structure of these companies, see Canada, Statistics Canada, *Corporate Ownership Interrelationships*, Cat. 61-517 (Ottawa: various issues 1970 to 1980).

C. Economies of Scale and the Sugar Refining Industry in Canada

In general, the level of market concentration in an industry will be high when there are economies of large scale (and no foreign competition from imports) at the plant level. That is, market concentration is likely to be high when plants of optimum sizes are large in relation to the size of the market. The per unit costs of production of these plants are usually lower than for plants of less than optimum sizes. In this case, exploitation of economies of large scale leads to a higher level of technical efficiency, though exertion of market power by the few firms in that industry could result in a lower level of allocative efficiency (prices substantially in excess of the marginal cost and output correspondingly smaller than socially optimal). This section uses the limited data that are available to examine the question of whether the level of market concentration in the sugar refining industry is justified by economies of large scale. This is done by examining the relationship between average total costs and the total quantity of output of refined sugar based on a limited number of observations.

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[13] The formula on which producers' sales receipts are based are that the producers receive 63 percent of the total sales and the refiner 37 percent. See Canada, Agriculture Canada, *Market Commentary: Horticultural and Special Crops* (1981).

Sources of Data

The data used in this analysis are from transcripts from the court case concerning Atlantic, Redpath and St. Lawrence.[14] These data refer to 1963, though one set of data for 1966 is also included. These data were compiled for internal use by the refiners concerned. It is, therefore, assumed that the data are fairly accurate. Even then, these data must be viewed with caution, since they are not adjusted for differences in the methods of compilation between plants. The sugar refiners from whom these data were available are Atlantic, Redpath and Cartier.

Evidence from transcripts of the recent sugar case show that in 1963 Cartier planned to build a sugar refinery in Montreal.[15] This company compiled annual data on total costs and associated output of five different sizes of sugar refineries based on engineering estimates. Table III-4 shows these estimated unit costs for the five plant sizes of 12,000, 24,000, 30,000, 36,000 and 42,000 tons of refined sugar per year(observations 1 to 5). The transcripts show that this set of data was computed by an engineer who had 43 years of experience in the sugar refining industry in the United States. It is assumed that the data are an accurate representation of the actual total costs associated with the different levels of the planned output of refined sugar. Similar data based on engineering estimates which were

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[14] The *Atlantic Sugar Refineries et al. v the Attorney General of Canada* (1980), Pleadings before the Supreme Court of Canada 38, 7502-06; 44, 8672-48; 50, 10075-78.
[15] *Ibid.*, (1980) 50, 10075-78.

TABLE III-4

Annual Average Total Costs of Refining Sugar at the Plant Level in Eastern Canada, 1963

Observation number	Refiner and location of refining plant	Total annual output of refined sugar per year	Annual average total cost
		1000 ton per year	dollars per 100 pounds
1	Cartier, Montreal	12	1.96
2	Cartier, Montreal	24	1.40
3	Cartier, Montreal	30	1.32
4	Cartier, Montreal	36	1.22
5	Cartier Montreal	42	1.22
6	Redpath, Montreal	159	1.38
7	Redpath, Toronto	103	1.27
8	Redpath (1966)	34	1.20
9	Atlantic, St. John	232	1.39

SOURCE: Court transcripts, as outlined in the text.

NOTES: Observations 1 to 5 and 8 are based on engineering estimates.
Observations 6, 7 and 9 are based on actual accounting records.

compiled during a feasibility study for a sugar refinery which Redpath considered constructing in London, Ontario in 1966 were also available from the court transcripts and are included in this study.[16] The annual output capacity of the sugar refinery considered in this feasibility study was 34 thousand tons of refined sugar (observation 8 in Table III-4).

The data which are based on actual accounting records of three sugar refining plants in Montreal, Toronto and St. John for 1963 are also taken from the court transcripts.[17] The accounting records were for Redpath's refining plants in Montreal and Toronto, and Atlantic's refining plant in St. John (observations 6, 7 and 9 in Table III-4).

The data on costs consist of costs of refining sugar (labour, non-sugar inputs, electricity), depreciation, storage and marketing of refined sugar. These cost data do not include the costs of raw sugar and transportion costs of refined sugar. It is assumed that the average per unit cost for these two components tend to be similar for all refining plants considered.[18] It is also assumed that differences in average total costs from one plant to another are due to differences in the annual quantity of output of refined sugar. Differences in costs associated with differences in managerial skills, the extent of capacity utilization, prices of inputs and other random variations at the plant levels are not taken into account. Unfortunately, more recent data are not available for this study.

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[16] *Ibid.*, (1980) 50, 10075-78.
[17] *Ibid.*, (1980) 38, 7506.
[18] This asumption may be justified because all refiners price the raw sugar on the basis of the London daily price. Also the per unit transportation costs for refined sugar is established by the transporters and are the same for all the refiners.

The Method of Assessing Economies of Scale

Several approaches to the estimation of the relationship between plant size and total cost are reviewed by French (1977).[11] In view of the limited data which are available, the examination of economies of scale in the Canadian sugar refining industry is presented using the envelope curve approach. First, the total costs associated with refining (labour, non-sugar inputs, electricity, and depreciation), storing and marketing of 100 pounds of refined sugar are computed from total costs and output of refined sugar for each plant. These costs per 100 pounds of refined sugar are presented in Table III-4. Second, the average total costs and total output are plotted on the graph. Figure III-1 shows the envelope curve which is fitted by hand to the lowest observations on the average total costs and output scatter diagram.

Refering to Figure III-1, the data based on the engineering estimates imply that average total costs decrease rapidly as output increases between 12 and 30 thousand tons of refined sugar annually. These data indicate that the lowest average total cost per 100 pounds of refined sugar seems to be attained when the annual output of refined

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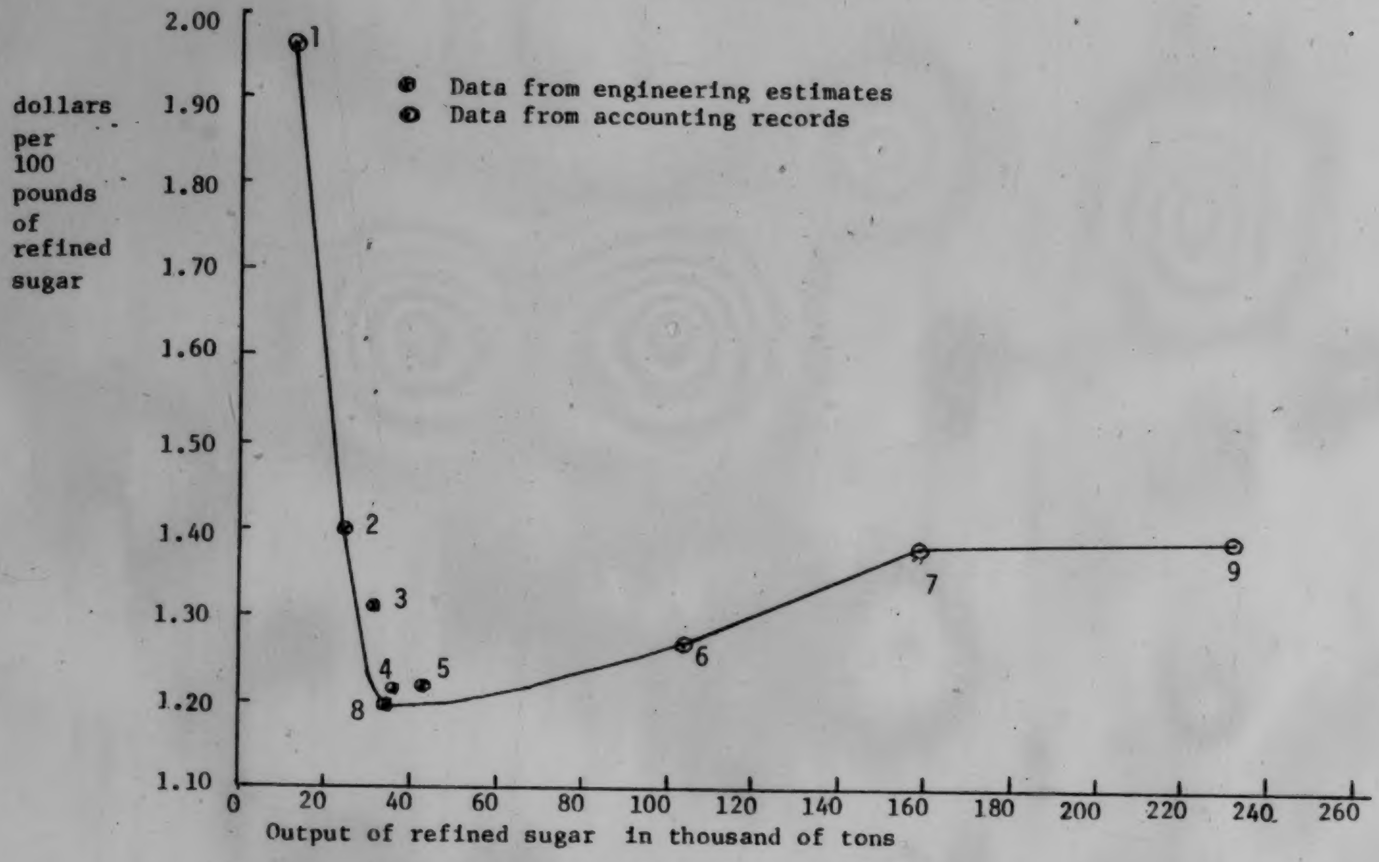
[11] For a detailed review of methods of estimating the relationships between plant sizes and average total cost, see Ben C. French, "The Analysis of Productive Efficiency" in Lee R. Martin, (ed.) *A Survey of Agricultural Economics Literature* 1 (Minneapolis: University of Minnesota Press, 1977), 127-131.

FIGURE III-1

Average Total Cost Curve of Refining Sugar in Eastern Canada, 1963
(dollars per 100 pounds of refined sugar)



SOURCE: Derived from Table III-4

sugar is in the neighbourhood of 30 to 50 thousand tons. Observations 6, 7 and 9 (data based on actual accounting records) suggest that average total costs increase slightly as the the quantity of output increases to about 160 thousand tons of refined sugar per year and that average total costs appear to level off with a higher volume of output per year.

From Figure III-1, it seems that in 1963, plants of optimum size had an output capacity averaging about 40 thousand tons of refined sugar per year. That is, plants of optimum size seemed to have an output capacity ranging from 30 to 50 thousand tons of refined sugar per year. It is tentatively concluded that technical efficiency in the Canadian sugar refining industry apparently was realized at an output capacity of between 30 and 50 thousand tons of refined sugar.

Other evidence from court transcripts pertaining to the *Atlantic Sugar* case indicates that relatively small sugar refineries were potentially as profitable as the existing larger ones. For example, in 1966 a representative of Redpath assessed the economic viability of a sugar refinery with an output capacity of 34 thousand tons of refined sugar per year. The representative concluded:

> It would appear that a small refinery with the capacity of 34 thousand tons of refined sugar and location contemplated by this study is indeed a viable proposition. At the levels of production and marketing conditions under review, the return on capital employed is equal or better to that enjoyed by the Canadian industry in general. The concept might be attractive to

> many and the capital requirements would not be prohibitive to most interests seeking new investment.[20]

Another example from court transcripts pertains to a cane sugar refinery which Robin Austin (the founder of Cartier) planned to build in Cornwall in 1972.[21] The output capacity of the planned refinery was 55 thousand tons of refined sugar per year. Austin noted "profit margins are excellent and operations can be completely sustained against those of the large refiners."[22]

Limited data reported by Bohall, et al. (1977) and the Food Prices Review Board (1975) from the United States and Canada, repectively, indicate that the sizes of cane sugar refineries in that country greatly exceed those in Canada for 1975.[23] The analysis of these data reported by the Food Prices Review Board and Bohall et al. indicates that the average daily output capacity of cane sugar refineries in Canada for 1975 was about 1700 thousand pounds of refined sugar compared to an average daily output of 2800 thousand pounds of refined sugar in the United States. The reported information indicates that in 1975 the smallest and largest plant sizes in Canada had daily output capacities of about 500 and 2,500 thousand pounds, respectively, compared to a daily output of 1,400 and 4,400 thousand pounds in the

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[20] *Atlantic Sugar Refineries et al. V the Attorney General of Canada* (1980), 50, 10075-78.

[21] This sugar refinery had been planned, though it was not built. There is no indication as to why this apparently viable plant was not eventually built. For further information about the plant, see *Ibid.*, 44, 8818-31.

[22] *Ibid.*, 44, 8818-31.

[23] Food Prices Review Board, *op. cit.*, (1975), 6; and Robert Bohall, et al., *op. cit.*, *75.*

United States. In the same year, the seven cane sugar refineries in Canada had the following daily output capacity: the largest three sugar refineries each had a daily output capacity of over 2,000 thousand pounds, the next two largest plants had daily ouput capacity between 1,700 and 2,000 thousand pounds. Considering the largest fourteen cane sugar refining plants in the United States, about seven of the refiners each had daily output capacities exceeding 3,600 thousand pounds. These plants were much larger than the largest plants in Canada. Four of the fourteen plants each had a daily output capacity of between 1,900 and 3,600 thousand pounds. In general, it appears that cane sugar refining plants in Canada were smaller than those in the United States. The relatively large sizes of plants in the United States and Canadian plants may not have been inconsistent with the results presented in Figure III-1 since annual average total costs in the refining industry do not appear to change substantially after plants of optimum size are attained. This suggests that there may be a range of optimum plant sizes which can be operated without substantial cost differences between small and large refining plants.

In general, the results presented in Figure III-1 appear to suggest that plants of optimum sizes in the refining of sugar may be moderately small compared to the largest plants and to the total market of refined sugar in Canada. Assuming that the smallest efficient plant size in

Canada in 1963 was 40 thousand tons of refined sugar and considering that the total Canadian consumption of refined cane sugar in that year was about 800 thousand tons, the maximum number of optimum sized plants could have been twenty. In that year, the number of cane sugar plants was only five. It is concluded that the high level of concentration in the Canadian sugar refining industry in 1963 does not appear to have been justified by economies of large scale at the plant level. There is no reason to believe that this situation has changed since 1963.

The above assessment of economies of scale in the Canadian refining industry should be viewed as tentative for a number of reasons. First, it should be noted that the age of each of the plants represented in Figure III-1 by each of the observations 6, 7 and 9, was different. The plant represented by observation 7 was new (built in 1959) compared to the other plants represented by observations 6 and 9. Also, observations 1 to 5 and 8 represent new plants that were to be constructed in the 1960s. Thus, the age of the plants and possible progress in technology may have an effect on the relationship between the levels of output and average total costs.

It is also worthy of note that multiplant economies of scale are not considered here explicitly. However, there does not appear to be cost-savings associated with Redpath's operation of two refineries (observations 6 and 7). This scanty evidence suggests that economies of multiplant operation are not evident in the Canadian sugar refining industry.

The estimates of economies of scale presented above do not take into account economies of scale of distributing refined sugar. As Bressler and King (1970, Chapter 8) stated, estimation of economies of scale of plants should "involve balancing of the decreasing average plant costs against increasing distribution costs" associated with fewer but larger plants. As reported by the Tariff Board (1971), costs of transporting refined sugar can be a large proportion of the price of sugar at the plant level.[24] Using transportation cost data reported by the Board it is estimated that transportation costs of refined sugar by rail from Toronto to Thunder Bay in 1971 was $1.67 per 100 pounds (the price of sugar in Toronto at the plant-gate was $9.90 per 100 pounds). This is equivalent to 17 percent of the price of refined sugar at the refinery. In view of the apparent high costs of transporting refined sugar to distant locations such as Thunder Bay, the combined costs of refining and distributing sugar should be considered in the estimation of plants of optimum sizes. Limitations of data did not permit this to be done here.

It has to be noted that the realization of the combined economies of scale of refining and transporting refined sugar would depend on a number of factors. One factor would be the available physical facilities and external economies such as the infrastructure, labor markets and sea ports in the locations considered for new refineries. Another factor is that the size of the local market would have to be large so that refined sugar would not be shipped over long distance to markets. Another consideration is that if the pricing of refined sugar is on the base point pricing system, with Montreal or Toronto as the base points, then savings in transportation costs would not result in lower prices of refined sugar to consumers.

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[24] The Tariff Board, *op. cit.*,54-59.

Another barrier to entry which may be associated with large economies of scale is the amount of capital that is required for successful entry into the industry. This barrier to entry could be high if the amount of capital necessary to build plants of optimum size is sufficiently large. It is noted that the extent to which capital requirements may deter the entry of new firms in an industry depends on the expected rate of return on investment and on the efficiency of capital markets.

Table III-5 summarizes five examples of the amount of capital requirements for starting new refineries or expanding existing refineries in Canada between 1959 and 1972. The data on capital requirements are from transcripts from the court case pertaining to Atlantic, Redpath and St. Lawrence and from financial reports published by the

Financial Post Services concerning Atlantic and Redpath.[25] These limited data suggest that the total capital required to build a new refinery between 1959 and 1972 may have ranged from about $3 to $14 million. The data also indicate that a plant size with an estimated output capacity of about 30 to 50 thousand tons of refined sugar per year would have cost between $3 and $5 million to build.

It does not seem that capital requirements constituted a major barrier to entry into the refining industry. Between 1963 and 1964, Cartier appear to have had no problem raising the capital required to start its new plant in Montreal.[26] Half a million dollars were borrowed from the Industrial Development Bank, a quasi-government agency. Another half million dollars were borrowed from the Royal Bank. The balance of the funds were provided by Robin Austin and the public who purchased shares in this company. Reference has already been made to an attempt by Robin Austin to build a new sugar refinery in Cornwall in 1972. Plans to raise the required capital had been completed and it appears that this had not involved any major problems. Court transcripts show that the Department of Regional Economic Expansion (DREE) and the Government of Ontario had agreed to provide a total

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[25] *Atlantic Sugar Refineries et al. v the Attorney General of Canada* (1980), Pleadings before the Supreme Court of Canada, 44, 8813-31; 50, 10075-78; and Financial Post Services, *Redpath Industries*(1980); *Idem, Jannock Corporation* (1980).
[26] *Ibid.*, (1980), 38, 7501.

TABLE III-5

Examples of Capital Required to Start a New Sugar Refinery in Canada Between 1959 and 1972

Year	Name of refiner	Location of refinery	output of the plant per year	Capital requirement
			1000 tons	$ millions
1959	Redpath	Toronto	135	14.0
1964	Cartier	Montreal	36	3.849
1966	Redpath*		34	3.119
1968	Atlantic	St. John	250	13.600
1972	Robin Austin*	Cornwall	55	5.796

SOURCE: Financial Post Services, *Redpath Industries* (1980); Idem, *Jannock Corporation* (1980); and *Atlantic Sugar Refineries et al. v the Attorney General of Canada* (1980), Pleadings before the Supreme Court of Canada 44, 8813-31; 50, 10075-78.

NOTES: * Refers to capital expenditure data based on engineering estimates.

of $1.3 million for this project.[27] About $3 million were to be raised by a mortgage loan and $2 million from the sale of shares of the company to the public. Evidence from court transcripts indicates that when Westcane built its refinery at Oshawa in 1974 the capital required was raised by George Weston, the parent company.

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[27] *Ibid.*, (1980), 44, 9415-16; and 50, 10078.

In summary, the limited information suggests that neither economies of large scale nor total capital requirements appear to have been main barriers to entry in the Canadian sugar refining industry. It is concluded that the high levels of concentration in the refining industry do not appear to be justified by either economies of large scale or substantial absolute capital requirements.

D. Customs Tariff Protection of the Sugar Refining Industry in Canada

One important facet of the Government of Canada's policy which appears to have had a major impact on the levels of concentration and competition in the Canadian sugar refining industry is the structure of customs tariff rates on imports of sugar. In general, high levels of customs duties tend to lessen competition from imports in the protected industry. High levels of customs duties can be expected to lead to higher levels of prices to the consumer and increased profits in the industry. In this section, two aspects of the customs duties are examined. First, the effect of the different Canadian customs tariff duties on competition in the market to supply sugar to this country is discussed. Second, an examination of the tariff protection afforded the Canadian sugar refining industry between 1960 and 1978 is presented. This involves an estimation of annual effective rates of protection of the refining industry during this period.

Nominal Tariff Rates and the Supply of Sugar to Canada

The two most important customs tariff duties levied on refined and raw sugar imports into Canada are contained in the Customs Tariff schedule items 13400-1 and 13500-1. As with most tariff schedules in Canada, there are three categories of tariff rates on every type of sugar imported into Canada. The lowest rates are the "British preferential" rates, the intermediate rates are those for "most favoured nation" and the highest are the "general" rates. The general rates have been of little importance to sugar imports and are not explicitly considered in this study. There are also special tariff rates which apply on raw and refined sugar used in the manufacture of wine and are 1 percent of the prevailing rates.

Table III-6 summarizes the British preferential and most favoured nation tariff rates. The difference between the British preferential rates and the corresponding most favoured nation rates is referred to as the preferential margin. The consequences of the different categories of customs duties on imports of sugar by country of export was that from 1960 to 1978, about 78 to 95 percent of the annual imports of raw sugar were from countries to which British preferential rates applied. As was reported by the Tariff Board (1971), if it was not for certain special features in respect of "drawbacks" of duty, almost all of Canada's imports of raw sugar would probably originate from British

TABLE III-6

Nominal Tariff Rates on Imports of Raw and Refined Sugar in Canada, 1960 to 1978

Period of time	Type of Sugar (degree of polarization* of sugar)	Customs Duty B.P.	M.F.N.	Preferential margins
		$ per 100 pounds of sugar		
1960-1973	refined (99)	1.09	1.89	0.80
1973-1978	refined (99)	0.00	1.12	1.12
1960-1973	raw (95-96)	0.29	1.29	1.00
1973-1978	raw (95-96)	0.00	1.00	1.00

SOURCE: Canada, Dept. of National Revenue, *Customs Excise Tariff Commodity Index 1980.*

NOTES: B.P. denotes British preferential rates and M.F.N. most favoured nation rates.
* Polarization is a measure of the sucrose content of sugar. The higher the sucrose content, the higher the polarization.

preferential countries.[24] It can be argued that the differences in the rates of duty on raw sugar from the two sets of countries may have limited the extent of competition between the suppliers of raw sugar since imports into Canada of sugar from most favoured nation countries were restricted by higher tariff barriers than imports from British preferential countries.

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[24] Tariff Board, *op. cit.*, 77-107. "Drawbacks" refer to the reductions in the customs duties levied on imports of sugar used in the manufacture of wine. See the above definition of special tariff rates.

The Levels of Tariff Protection

The principal purpose of this part of the study is to examine the likely effects of the different categories of the customs tariff rates on the price levels of sugar in Canada. This also involves estimation of the extent of the annual effective rates of protection afforded the refining industry from 1960 to 1978.

Table III-6 shows that the level of customs duties levied on imports of raw sugar was low from 1960 to 1973. Since then, most raw sugar has entered Canada duty-free. The low level of customs duties levied on imports of raw sugar indicates that the level of tariff protection afforded the sugar beet growers has been low. However, as was noted by the Tariff Board (1971), growers of sugar beets in Canada, especially in western Canada, are substantially protected against foreign competition by the costs of transporting (ocean and land freight rates) raw sugar to sugar beet producing areas.[29]

The maximum price which could be charged for sugar refined in Canada without attracting imports of refined sugar depends on whether imports of raw and refined sugar originate from nations to which British preferential or most favoured nation rates apply. Assume two different situations. In one, imports of raw and refined sugar are from British preferential countries. In another situation, imports of raw and refined sugar are from British preferential and most favoured nation countries, respectively.[30] Further, it is assumed that the costs of shipping and handling imports of raw and refined sugar and the costs of refining sugar in Canada and in foreign countries are the same. The extent of tariff limit pricing can be calculated as the difference between the price of domestic refined sugar at the plant-gate and that of foreign refined sugar (cost, insurance, freight and duty paid) landed at a Canadian port.

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[29] Tariff Board, *op. cit.*, 239-242.

Table III-7 shows the maximum price rise which Canadian refiners can charge for refined sugar without attracting imports of this product. When imports of both raw and refined sugar are from British preferential countries, the effect of customs duties would be a decline of $0.02 per 100 pounds of refined sugar (negative nominal tariff protection). When supplies of raw and refined sugar are from British preferential and most favoured nation countries, respectively, the effect would be a maximum price increase of about $0.78 per 100 pounds of refined sugar without attracting imports. As outlined in Chapter IV, from 1960

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[30] As outlined in Chapter II, about 85 to 95 percent of raw sugar imports into Canada are from British preferential countries, while most refined sugar originates from most favoured nation countries.

TABLE III-7

The Maximum Possible Change in the Price for Refined Sugar Due to Customs Duties in Canada, 1960 to 1973

		Customs Duty by source of supply of raw/refined sugar	
		BP/BP	BP/MFN
		---------dollars------	
(1)	Refined sugar, per 100 lb	1.09	1.89
(2)	Raw sugar, per 107 lb**	0.31	0.31
(3)	Remittance to BP raw sugar suppliers per 107 lb	0.80	0.80
(4)	Total on 107 pounds of raw sugar** (2 + 3)	1.11	1.11
	Net difference in duty (1 - 4)	-0.02	0.78

SOURCE: Calculated from Table III-6.

NOTES: BP/BP means that both raw and refined sugar are imported from British preferntial countries. BP/MFN means that raw and refined sugar originate from British preferential and most favoured nation countries, respectively.
** About 107 pounds of raw sugar (polarizing at 96 degrees) are equivalent to 100 pounds of refined sugar.

onwards, importers of raw sugar in Canada have traditionally remitted $0.75 per 100 pounds of raw sugar (part of the preferential margin) to suppliers of raw sugar in British preferential countries. In the above calculation this remittance is assumed to be part of the tariff duty on raw sugar. It can be argued that this is not the case and therefore, the inclusion of the $0.75 as part of the customs duty on raw sugar underestimates the level of direct protection afforded the refining industry. If this remittance had not been made, the maximum price rise on refined sugar due to the customs duties could have been greater than the estimates in Table III-7 by about $0.80. In general, the extent to which the sugar refiners can raise the price of refined sugar without attracting imports is substantial.

Nominal tariff rates on imports of sugar allow Canadian refiners to raise the price of refined sugar in Canada to the price of imported refined sugar plus the customs duty on imports of that sugar so as to limit imports of refined sugar into Canada. The nominal tariff rates do not, however, take into account the nominal tariff duties on all inputs used in the final product as well as on imports of the final manufactured product. The effective rate of protection measures the total tariff protection afforded an industry. It is defined as the change in value-added (expressed as a percentage of value-added before the tariff) which arises from the imposition of customs duties on imports of the manufactured good and on all inputs used in the production of that good.[31] It is:

$$g_j = \frac{v' - v}{v} \quad \text{-------------------- (III-1)}$$

Where:

g denotes the effective rate of protection for industry j;

v' denotes value-added per unit of output under tariff protection; and

v denotes value-added per unit of output before protection is imposed.

Value-added refers to returns to primary factors of production, namely labor and capital.

Estimates of the annual effective rates of protection of the Canadian sugar refining industry are based on the equation that was used by Melvin and Wilkinson.[32] This is the expanded form of Equation III-1. It is:

$$g_j = \frac{\left[1 - \sum_i^n a_{ij}\right] - \left[\frac{1}{1+t_j} - \sum_i^n \frac{a_{ij}}{1+t_i}\right]}{\frac{1}{1+t_j} - \sum_i^n \frac{a_{ij}}{1+t_i}} \quad \text{------------(III-2)}$$

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[31] For a detailed discussion of the theory of the effective rate of protection, see M. Corden, *The Theory of Protection* (London: Oxford University Press, 1972), 108-118; and for an empirical estimation of effective rates of protection in the Canadian economy see, for example, J.R. Melvin and B.W. Wilkinson, *Effective Protection in the Canadian Economy* (Ottawa: Economic Council of Canada, 1968), 8-11.

[32] *Ibid.*, 8-13.

Where:

$$V' = 1 - \sum_{j}^{n} a_{ij}$$

$$V = \frac{1}{1+t_j} - \sum_{i}^{n} \frac{a_{ij}}{1+t_i}$$

1 implies that one unit of output of the final product of industry j under the existing tariff protection of an industry has a value of 1;

a_{ij} denotes the input-output coefficient of input i into the production of one unit of the final product j;

n denotes the total number of inputs in the manufacture of the final product j;

t_j denotes the ad valorem tariff rate on imports of the final product j; and

t_i denotes the ad valorem tariff rate on the ith input.

In general, the procedures used and assumptions made by Melvin and Wilkinson (1968) are adopted in this study.

The level of the effective rate of protection can be taken as a proxy measure of the level of barriers to entry confronting foreign exporters of refined sugar to Canada. It may be that the high level of market concentration in the sugar refining industry in Canada is closely associated with high levels of effective rates of protection. This section enables an assessment of this by providing estimates of annual effective rates of protection of the sugar refining industry in Canada for the period of time from 1960 to 1978. The model used in the estimation is described above.

Annual data on the costs of each of the inputs used in the refining of sugar and the total value of shipments of refined sugar are published by Statistics Canada.[33] The customs duties levied on imports of each of the inputs are published by Statistics Canada and Revenue Canada.[34] In this study, it is assumed that refined sugar is the only final product of the sugar refining process. The assumption is justifiable because refined sugar has accounted for about 95 to 98 percent of the total value of shipments of the industry for the period of time considered.[35]

Inputs used in the refining of sugar are categorized into eleven classes for the purpose of this study. Each class may contain one or more inputs. An attempt is made to place closely related items in one input class. The eleven classes include raw sugar, sugar beets, molasses, sugar syrups, starches, charcoal, acids and chemicals, containers, all other materials, fuel and electricity, and maintenance and operating services. The per unit tariff rates on raw sugar are computed as the annual value of the total customs duty levied on imports of raw sugar as a percentage of the total value of imports of raw sugar in that year. A similar procedure is used to compute the per unit tariff rates on refined sugar. In both cases that part of the preferential margin which is remitted by the Canadian importers of raw sugar to suppliers of raw sugar in countries to which British preferential rates apply is not considered as customs duty. This is taken as part of the costs incurred in the procurement of raw sugar. The per unit tariff rates levied on the other inputs are published by Revenue Canada.[36] When a class of inputs consists of several items, the average customs tariff rate of all the inputs in that class is used in the model. The assumption made by Melvin and Wilkinson (1968) on the per unit tariff rate assigned to "all other material" and to "maintenance and operating services" is adopted in this study. They assigned to these two classes of inputs the average per unit rate on all dutiable inputs used in the refining of sugar.[37] As was also assumed by Melvin and Wilkinson, fuel and electricity are assigned the per unit tariff of zero. The input-output coefficients are computed as the ratios of the total costs of all inputs in a particular class to the value of the total annual shipments of refined sugar.

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[33] Canada, Statistics Canada, *op. cit.*, Cat. 32-222 (various issues, 1960 to 1979).

[34] *Idem*, *Trade of Canada, Imports*, Cat. 65-203. (various issues, 1960 to 1978): and Canada, Revenue Canada, *Customs and Excise Tariffs* (various issues, 1960 to 1980)

[35] See Canada, Statistics Canada, *op. cit.*, Cat. 32-222 (various issues).

Table III-8 shows the estimates of the annual effective rates of protection as well as the nominal tariff rates (on refined sugar) applying to the sugar refining industry. The nominal tariff rates are calculated as the customs duty levied on a unit of imports of refined sugar expressed as a percentage of the per unit price of those imports. For each of the years considered, except in 1966, the estimated effective rates of protection are higher than the per unit customs duties, expressed as percentages of the price for refined sugar. The estimated average effective rate of protection for the refining industry from 1960 to 1978 is 42 percent, while the the average per unit tariff rate is 11.4 percent. [34] When the estimates for the years when sugar prices were unusually high (1963, 1964 and 1974) are excluded, the average per unit tariff rate is 11.8 compared with 26.6 percent for the effective rate of protection for the same period of time. From 1974 to 1978, when customs duties on sugar imports were substantially reduced and the prices for sugar tended to be high, the per unit tariff rates averaged 5 percent compared to 13 percent for 1960 to 1973. The annual effective tariff rates from 1974 to 1978 (after customs duties were reduced) did not decline accordingly. The estimated effective tariff rates were an average of 65 percent for 1974 to 1978 compared to 32.2

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[36] Canada, Revenue Canada, *op. cit.*,(various issues, 1960 to 1978).

[37] J.R. Melvin and B.W. Wilkinson, *op. cit.*

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[34] It is worthy of note that the estimates of effective rates of protection afforded the sugar refining industry in 1963 and 1974 are considerably high and seem to overstate the actual effective rate of protection afforded this industry. As stated by Melvin and Wilkinson (1969, p. 72) these large estimates may have resulted from the large increases in prices of raw and refined sugar and the fact that the customs duties are on a per-unit rather than *ad valorem* basis. Another reason may be that there are lags in the reported data on the quantities and values of imports of raw and refined sugar, as well as on the values of duties collected during these years.

TABLE III-8

Estimates of Effective Rates of Protection and Nominal Tariff Rates on Refined Sugar in Canada, 1960 to 1978

Year	Customs duty (as a percentage of the price of refined sugar)	Effective rate of protection (as a percentage of value-added before tariffs)
1960	9.2	10.7
1961	13.0	24.9
1962	14.0	24.9
1963	16.0	104.2
1964	13.8	64.2
1965	16.9	32.3
1966	14.6	10.8
1967	13.2	14.9
1968	13.7	17.8
1969	17.8	39.0
1970	15.1	28.6
1971	12.5	16.2
1972	9.8	32.8
1973	9.6	61.9
1974	3.9	212.0
1975	4.1	20.3
1976	5.7	32.0
1977	8.1	42.8
1978	4.6	18.9
Average 1960-1978	11.4	42.2

NOTES: From 1973/1974, per unit customs duties on raw and refined sugar were considerably reduced.

percent for 1960 to 1973. This suggests that the level of effective tariff protection did not decline after the reduction of customs duties in 1973. Overall, the level of effective tariff protection of the refining industry appears to have been high from 1960 to 1978.

The above results agree with the results of earlier studies by Melvin and Wilkinson (1968), the Tariff Board (1971) and Wilkinson and Norrie (1975).[39] Melvin and Wilkinson used the model adopted in this study to estimate the effective rates of protection for 1963 and 1965 using the Canadian most favoured nation tariff rates on raw and refined sugar. These authors recalculated the effective rates of protection for 1963 using Canadian customs duties which applied to raw and refined sugar from the British preferential and the most favoured nation countries, respectively. Estimates of the effective rates of protection were 39 and -8 percent for 1963 and 1965, respectively for the first calculation. The corresponding nominal tariff rates were 21 and 24 percent of the price for refined sugar in 1963 and 1965, respectively. In the second calculation the effective rate of protection was 47 percent for 1963 while the nominal tariff rate was 12 percent of the price for refined sugar.

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[39] For a detailed discussion of these studies, see J.R. Melvin and B.W. Wilkinson, *op. cit.*, Tariff Board, *op. cit.*, 176; and B.W. Wilkinson and K. Norrie, *Effective Protection and the Return to Capital* (Ottawa: Economic Council of Canada, 1975), 5-6, 29, 79.

In 1971 the Tariff Board estimated the effective rates of protection on the sugar refining industry in Canada, using a model similar to the one adopted by Melvin and Wilkinson (1968) for 1971. The estimated effective rates of protection varied from -3.7 to 96.4 depending on the assumption made regarding the treatment of the preferential margin (whether the margin was considered as a tariff duty or as a cost of raw sugar). The corresponding nominal tariff rates for that year ranged from 8.1 to 33.0 percent of the price for refined sugar.

Wilkinson and Norrie (1975) estimated the effective rates of protection of the sugar refining industry as well as for other industries in Canada for the years 1961 and 1966, adopting the model used by Melvin and Wilkinson (1968). The nominal tariff rates used in their estimation were those that applied to imports of raw and refined sugar from most favoured nation countries. The estimated effective rates of protection for 1961 and 1966 were 128 and 59 percent, while the nominal tariff rates were 21 and 15, respectively.

From the estimates of effective rates of protection made in this study and from the earlier studies, it appears that the estimates give only a general indication of the extent of tariff protection afforded this industry. As noted earlier, the estimates are affected by the price levels for raw and refined sugar, the sources of the sugar imports and the assumption made about the treatment of the preferential margin in the estimation of effective rates of protection. Even so, it appears that the levels of the effective tariff protection afforded the Canadian sugar refining industry have been high.

IV. ASPECTS OF THE MARKET CONDUCT OF SUGAR REFINERS IN EASTERN CANADA

The main purpose of this chapter is to outline some patterns of market conduct of Atlantic, Redpath and St. Lawrence and analyse the impact of those patterns on competition in the eastern Canadian sugar refining industry between 1960 and 1973. The main sources of evidence for this analysis are court transcripts from the *Atlantic Sugar* case of 1976, 1978 and 1980. This evidence is available for the period of time between 1960 and 1973. The types of market conduct assessed are exclusionary tactics which Atlantic, Redpath and St. Lawrence used to deter or in an attempt to deter the entry of new refiners and importers into the market for refined sugar, the sharing of the eastern Canadian market for refined sugar by these refiners and the pricing of refined sugar in eastern Canada.

Before these features of market conduct are assessed, a review is undertaken of some theories of market behavior of firms in oligopolistic industries. First, a brief outline of some economic models of oligopolistic market behavior is presented. Second, two models which appear to closely approximate some features of market conduct alleged during the court case are discussed in detail. The objective is to assess the extent to which certain patterns of market conduct of sugar refiners in eastern Canada may have approximated some patterns of market conduct predicted from certain oligopoly models. It is expected that the level of market competition and some features of performance of this industry can be inferred from this analysis. It is also expected that the adequacy of the anticombines regulations for the promotion and maintenance of market competition in the Canadian economy can be discussed in the framework of this analysis.

A. Economic Theories and Some Empirical Studies of Market Conduct in Oligopolistic Industries

Economic theories of oligopolistic market conduct generally suggest that oligopolists may respond in a number of ways to the actions of their rivals. As a result of this, they may behave in a way which may be variable, complex and predictable in some cases while unpredictable in others. Stanbury and Reschenthaler (1977) summarized the theory of oligopolistic behavior as follows:

> Unlike the accepted theory of perfect competition or that of pure monopoly, there are many theories of oligopoly behaviour. To the extent that they are deterministic, they rely upon unrealistic assumptions. To the extent that they are behaviourally rich in their assumptions, they are non-deterministic in terms of the price, profit and level of output they predict. R.B. Heflebower writes "Economists have not been able to develop a theory of price behaviour for manufacturing industries with few sellers for when sellers are few they tend to be 'jointly acting' oligopolists because of the conjectural interdependence among them. Each seller is restrained by his expectations as to how his rival will react to a price change by him. There is a circularity in sellers' reactions and there is no definitive theory of how the circle is broken except by some collusive device".[1]

Despite these difficulties, economists have developed theories of oligopolistic behavior with determinate solutions. The extent of survival and stability of oligopolies seems to depend on the nature of their interdependence.

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[1] W.T. Stanbury and G.B. Reschenthaler, "Oligopoly and Conscious Parallelism: Theory, Policy and Canadian Cases," *Osgoode Hall Law Journal* 15 (Dec. 1977): 623.

There are several economic models which attempt to predict patterns of oligopolistic behavior concerning price and output levels. There are those which focus upon the conjectural variations of how the rivals' output will alter as a result of its own output. These are Cournot's duopoly model; the collusion model; the Stackelberg model; and the market shares model (Cohen and Cyert, 1975).[2] Cohen and Cyert also describe those models which do not necessarily focus on the conjectural variation of oligopolists. These are the dominant firm price leadership model, the barometric price leadership model, the joint profit maximization model and the kinked demand model. Each of the models yields some insight, but each has limitations. In this section, the dominant firm price leadership and joint profit maximization models are discussed in detail since they seem to approximate certain features of market behavior which were alleged in the recent *Atlantic Sugar* case.

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[2] For a detailed discussion of oligopoly models, see F.M. Scherer, *op. cit.*, Chapters 4-7; J.M. Henderson and R.E. Quandt, *Microeconomic Theory: A Mathematical Approach* (New York: McGraw Hill Book Co., 1980), 199-222; and K.J. Cohen and R.M. Cyert, *Theory of the Firm: Resource Allocation in a Market Economy* (New Jersey: Prentice-Hall, 1975), Chapter 12.

The Dominant Firm Price Leadership Model

As is discussed by Scherer (1970), one of the main conditions which tends to facilitate price leadership in an industry is the existence of some degree of homogeneity of products in an industry.[3] This condition applies in the sugar refining industry in Canada. The dominant firm price leadership model implies a set of industry practices under which list price changes are normally announced by a dominant firm in that industry. The other firms in the industry follow the leader's initiatives without collusion. The assumption, in effect, removes the follower firms from consideration as rivals in the usual sense. Equilibrium in the industry is attained when the price leader chooses a price level which maximizes its own profits subject to the correctly predicted output (at that price) of the rest of the industry. The equilibrium solution as predicted by this model is illustrated in Figure IV-1.

In Figure IV-1 the market demand curves for the industry and the price leader are denoted by DD and GB, respectively. The marginal revenue and marginal cost curves of the price leader are denoted by GMR and MC, respectively. The total supply curve for all price followers is denoted by CS (the horizontal summation of their marginal cost curves). GB is the residual of the industry demand appropriable by the price leader after the followers have provided the quantity specified (at that price) by their supply schedule

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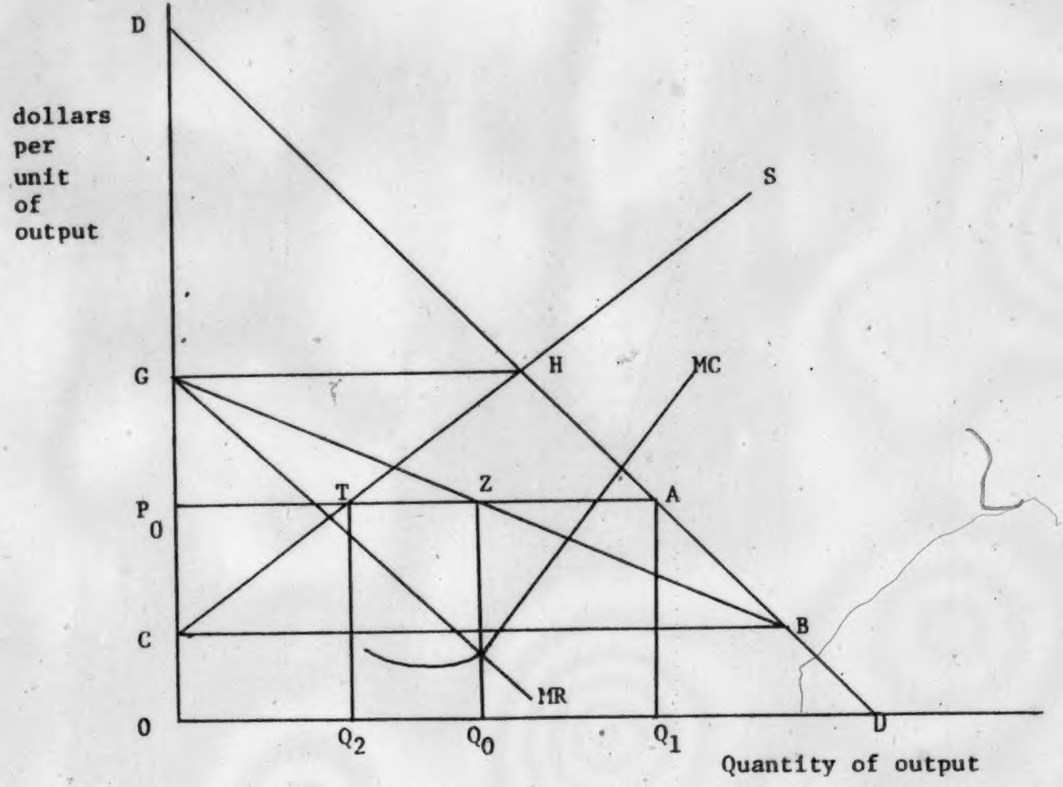
[3] F.M. Scherer, *op. cit.*, 165.

FIGURE IV-1

Dominant Firm Price Leadership Model of Oligopoly


D
dollars
per
unit
of
output
S
G
H
MC
T
Z
A
P_0
C
B
MR
0
Q_2
Q_0
Q_1
D
Quantity of output

SOURCE: F.M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally Publ., 1970),165.

(CS). The price leader maximizes profits when its marginal cost (MC) and marginal revenue (MR) are equated. The price which maximizes profits of the price leader is denoted by P_0 in Figure IV-1. The model assumes that price followers accept the price P_0 and supply output Q_2 of the total market (where the price is equal to marginal cost of the followers).[4] At the price P_0 the total output produced by the industry is Q_1, the leader will provide output denoted $Q_0 = (Q_1 - Q_2)$. The lower is the price below P_0, the higher is the market share of the dominant price leading firm and vice versa. For example, at prices lower than C the whole market will be supplied by the dominant firm, while at prices higher than G the whole market is supplied by the follower firms. Thus, the solution is determinate, assuming that the price leader is universally recognized as such. The model explains that the market shares of each of the price leader and followers will tend to change in the long-run in response to changes in costs and demand schedules.

As indicated by Henderson and Quandt (1980), under the assumptions of the dominant firm price leadership model, the level of output of an industry is higher and prices and total profits lower than those predicted under the joint profit maximization model.[5] It follows that the level of economic efficiency will be higher (higher levels of output and lower levels of prices) under the conditions of the dominant firm price leadership model than those of the joint profit maximization model. Perhaps it is on this basis that the features of market conduct inferred from the dominant firm price leadership model (implying conscious parallelism) are legal and those inferred from the joint profit maximization model (market collusion) are illegal under anticombines law in Canada.

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[4] By construction Q_2 is equal to $Q_1 - Q_0$.

[5] J. M. Henderson and R. E. Quandt, *op. cit.*, 201-207.

A basic problem with the dominant firm price leadership model is that it is difficult to determine whether the price leader in fact seeks to maximize its own short-run profits. Further, it is implicitly assumed that the price leader can estimate a priori or by trial and error, total demand of the industry, along with the supply function of the price followers.

The Joint Profit Maximization Model

The joint profit maximization model is based on the assumption that oligopolists recognize the benefits of mutual dependence and agree to act together to maximize total profits of the industry. This results in the same levels of price, output and profits which would exist were the industry a monopolist. When the collusive arrangement is openly accomplished through formal agreement, it is called a cartel (Cohen and Cyert, p. 249).

Osborne (1976) illustrated the problems associated with the formation and stability of cartels in the context of a duopoly model, using Figure IV-2.[6] He noted that cartels are inherently unstable mainly because of problems associated with sharing the market by the members of a cartel and the problems of enforcing adherance to a cartel price.

Figure IV-2 is an isoprofit map of duopolists. Curves I^1_1 to I^1_6 represent the isoprofit map for firm 1, while curves I^2_1 to I^2_6 represent the isoprofit map for firm 2.[7] For firm 1 profits associated with the isoprofit contour I^1_1 are greater than those of contour I^1_2 and so on. For firm 2 the profits associated with isoprofit contour I^2_1 are greater than those of contour I^2_2, and so on. Pareto efficient profit maximization of the duopolists is achieved at the points where the isoprofit lines of firms 1 and 2 are tangent to each other. The loci of the tangency points which is denoted by C_0C_0 in Figure IV-2 is called the contract curve. The first internal problem of a cartel is to determine this contract curve.

The second problem of the duopolists is to determine shares of the market such that total profits are maximized. In terms of Figure IV-2, this requires the determination of a point on the contract curve, for example point q. At this point, the market shares of firms 1 and 2 will be represented by Q^1_1 and Q^2_1, respectively. The shares of the

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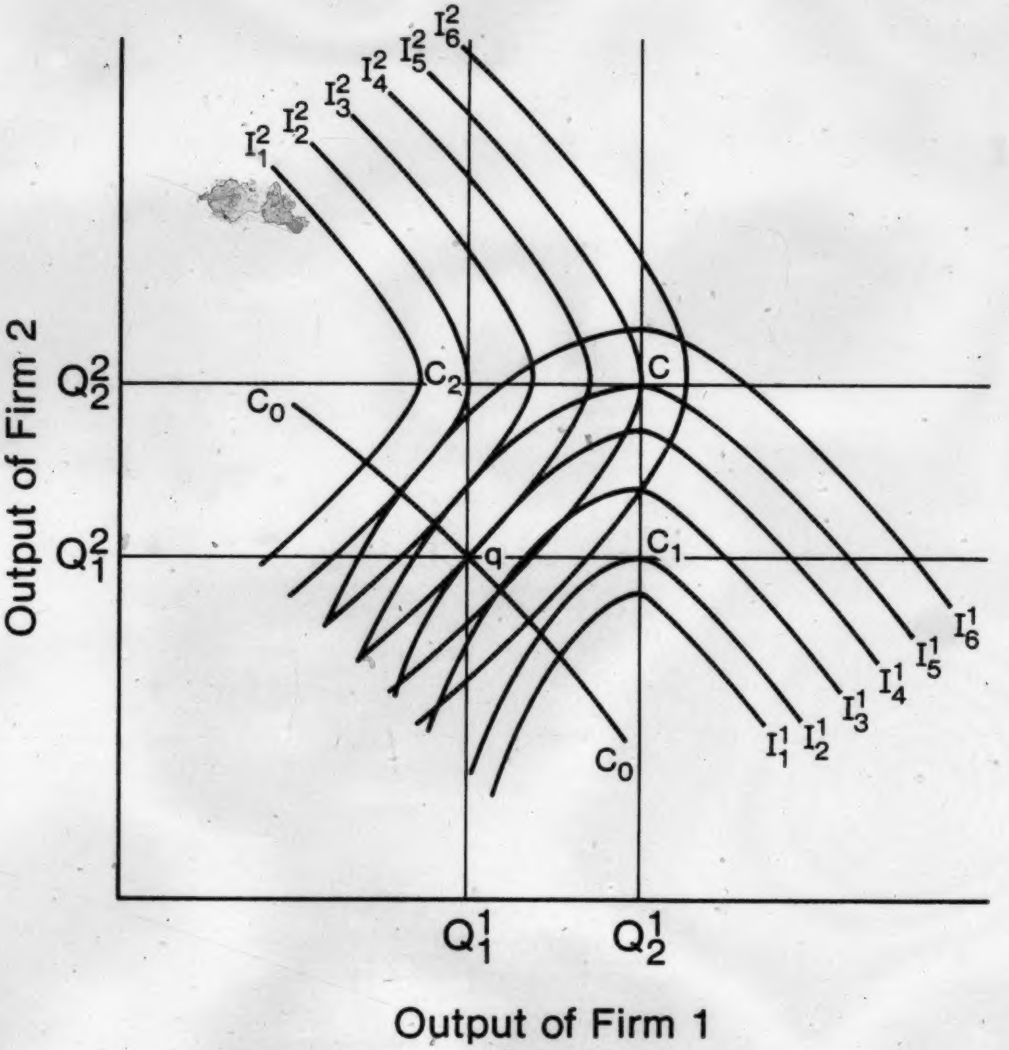
[6] D.K. Osborne, "Cartel Problems", *American Economic Review* 66 (1976), 835-844. Also see M. Spence, "Efficient Collusion and Reaction Functions," *Canadian Journal of Economics* 11 (1978):490-505.

[7] The superscripts 1 and 2 denote firms 1 and 2, respectively, while subscripts denote the levels of profits.

FIGURE IV-2

Levels of Profits and Output Under Cartel Conditions


I_1^2
I_2^2
I_3^2
I_4^2
I_5^2
I_6^2
C_2
C
C_0
q
C_1
C_0
I_1^1
I_2^1
I_3^1
I_4^1
I_5^1
I_6^1
Q_2^2
Q_1^2
Output of Firm 2
Q_1^1
Q_2^1
Output of Firm 1

Source: D. K. Osborne, "Cartel Problems," *American Economic Review* 66 (1976): 836.

market held by the duopolists would depend on the balance of bargaining power between them.

The third problem of the cartel is to detect and deter any cheating. For example, in Figure IV-2, if firm 2 cheats by increasing output from Q_1^2 to Q_2^2 thereby increasing profits, while output of firm 1 remains constant at Q_1^1 then the output combination is denoted by C_2. At this point, profits of firm 1 fall below those earned under perfect collusion (I_4^1). Similarly, if firm 1 cheats and 2 does not, the volume of sales of firms 1 and 2 each will be denoted by Q_2^1 and Q_1^2, respectively, (point C_1). If both firms cheat, the market shares of firms 1 and 2 will be denoted by Q_2^1 and Q_2^2 respectively (point C). In general, this model suggests that there is a tendency for individual members of a cartel to secretly increase output and market shares and, therefore, profit through secret price cuts.

Osborne (1978, p. 838-841) uses a theoretical model to show that the problem of cheating by cartel members can be resolved if the members of a cartel incorporate a "quota rule" in a cartel agreement. Under this rule, if firm 1 cheats by off-list pricing, firm 2 retaliates by off-list pricing and increasing output so that market shares are preserved. In this case firm 2 will lose less than by remaining at q in Figure IV-2 and vice versa, while firm 1 loses any excess profits. Thus, under a quota rule, the loyal firm is better off retaliating and no member is tempted to cheat unless the firm can escape detection by the other cartel members. As discussed later in this chapter, it appears that the eastern Canadian sugar refiners applied the quota rule to maintain constant market shares in the 1960s and early 1970s and to correspondingly deter cheating and control instability.

Spence (1978) also concluded that the solution to the unstable nature of colluding firms (cartels) is to apply a quota rule to members of a cartel.[8] It has been asserted by Caves and Porter (1978) that instability of market shares, especially among an industry's leading firms provides a measure of rivals' behavior.[9] They argued that stability of market shares in the presence of economic disturbances is a likely reflection of stability and completeness of oligopolistic collusion.

B. Some Evidence on Market Conduct of Sugar Refiners in Eastern Canada

Three patterns of market conduct which were alleged in court during the *Atlantic Sugar* case are examined. These were the alleged sharing of the market for refined sugar in fixed proportions; exclusionary tactics used to deter the entry of new competitors; and the pricing of sugar by eastern Canadian refiners. The Crown maintained that these patterns of market conduct were as a result of collusion and that the consequence was the lessening of competition unduly. An attempt is made to assess the impact of these conduct patterns on the level of competition in that market. Additionally, implications for competition policy are discussed concerning each of these patterns of market conduct. The main source of data for the assessment is the court transcripts from the *Atlantic Sugar* case (1976, 1978 and 1980).

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[8] M. Spence, *op. cit.*

[9] R.E. Caves and M.E. Porter, "Market Structure, Oligopoly and Stability of Market Shares," *Journal of Industrial Economics* 26 (June 1978): 289-308.

Stable Market Shares and Competition

Data on annual market shares of Atlantic, Redpath and St. Lawrence in the market for refined sugar in eastern Canada from 1940 to 1973 are from transcripts of the court case pertaining to these refiners.[10] The mean value, standard deviation and coefficient of variation about the mean of the market shares of the three refiners are calculated for the periods 1940 to 1949, 1950 to 1959 and 1960 to 1973, as well as for the entire period from 1940 to 1973.[11] During the first sub-period, the Government of Canada allocated sugar to Atlantic, Redpath and St. Lawrence in the ratios of 35.5, 43.0 and 21.5, respectively. Between 1950 and 1959 the Government of Canada did not control the market shares of the three refiners. The Crown alleged in court during the

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[10] *The Queen v Atlantic Sugar Refineries et al.* (1978), Pleadings before the court of appeal, Montreal, 32, 6396-99.

[11] The standard deviation is a measure of variation or dispersion in a data set. It is defined as the square-root of the variance. The coefficient of variation is a relative measure of dispersion in a data set. It is expressed as a percentage of the standard deviation divided by the mean of the data set. Robert D. Mason, *Statistical Techniques in Bussiness and Economics* (Illinois: Richard D. Irwin, 1978), 100- 101.

Atlantic Sugar case that from 1961 to 1973 the relative market shares of the three refiners were not different from those realized from 1940 to 1949.

Table IV-1 summarizes the means, standard deviations and coefficients of variation in the annual market shares of Atlantic, Redpath and St. Lawrence for the different periods of time from 1940 and 1973. The standard deviations and coefficients of variation show that there was little difference in the variability in market shares within these periods for each of the refiners. The variability in market shares (for each of the refiners) from one year to another between 1940 and 1973 was almost identical to that realized between 1940 and 1949 when the Government of Canada allocated imports of sugar to these refiners. From 1950 to 1959 there was an increase in the variability in market shares of each of the refiners. The variability declined for the period of time from 1961 to 1973. The coefficients of variation show that within each period of time, Redpath (the dominant firm) had the lowest variability in market shares while those of St. Lawrence (the smallest of these three refiners) had the highest year to year variation within any one period.

The differences between the means of market shares for the period of time from 1940 to 1949 and from 1961 to 1973 for Atlantic, Redpath and St. Lawrence are evaluated using a

TABLE IV-1

Stability of Shares of the Market of Three Sugar Refiners in Eastern Canada Between 1940 and 1973

Name of refiner	Market shares during 1940-73	1940-49	1950-59	1961-73
	percentages			
Atlantic:				
Mean	35.1	35.6	34.6	35.1
S.d.	1.24	0.96	1.59	1.02
C.v.	3.5	2.7	4.6	2.9
Redpath:				
Mean	43.1	42.7	43.5	43.1
S.d.	0.97	0.56	1.42	0.72
C.v.	2.2	1.3	3.2	1.6
St Lawrence:				
Mean	21.8	21.7	21.9	21.8
S.d.	1.02	0.75	1.32	1.02
C.v.	4.6	3.4	6.0	4.6

SOURCE: Calculated from Appendix IV-1.

NOTES: S.d. denotes standard deviation; and
C.v. denotes coefficient of variation.

two-tail t test.[12] The objective is to determine whether or not there are significant differences between the means of market shares during 1940 to 1949 and 1961 to 1973, for each of these refiners.

Table IV-2 shows that the computed and critical values of the two-tail t statistic for the market shares of each of the refiners fall within the range of the tabulated values of t of plus and minus 2.83, at the 1 percent level of significance (with 21 degrees of freedom).[13] That is, there is not a significant difference between the means of market shares during 1940 to 1949 and 1961 and 1973 for Atlantic, Redpath and St. Lawrence. There is no evidence that the situation has changed since 1973. The hypothesis that there is not a significant difference between the means of market shares realized during 1940 to 1949 and during 1961 to 1973 by Atlantic, Redpath and St. Lawrence, respectively, is accepted.

Some evidence from the court transcripts in the *Atlantic Sugar* case suggests that the relative stability of

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[12] The two-tailed t statistic is used to test whether two means of two samples are significantly different from each other. That is, the null hypothesis does not stipulate the direction of the difference between means (Mason, 294). For the method of calculating values of the t statistic, see Norman H.Nie, C. Halail Hull, Jean G. Jenkins, Karin Steinbrenner and Dale H. Bent, *Statistical Package for the Social Sciences* (New York: McGraw-Hill Book Company, 1975), 267-275.

[13] Norman H.Nie, C. Halail Hull, Jean G. Jenkins, Karin Steinbrenner and Dale H. Bent, (1975, p. 268) have defined the level of significance as "the smallest probability that will be accepted as reasonable due to chance or sample variability."

TABLE IV-2

The Computed and Critical Values of t Statistic for the Market Shares of Atlantic, Redpath and St. Lawrence From 1940 to 1949 and From 1961 to 1973

	Values of t statistic	
Name of refiner	Computed	Critical at the 1 percent level of significance
Atlantic	1.50	2.83
Redpath	-1.25	2.83
St. Lawrence	-0.32	2.83

market shares over the period of time from 1961 to 1973 was due to collusion between refiners. First, between 1955 and 1957, B.C. Sugar acquired Manitoba Sugar. Green (1980) has reported that before this merger in 1955, Atlantic, Redpath and St. Lawrence controlled about 30 percent of the market for refined sugar in Manitoba.[14] Evidence from the court transcripts indicates that the three refiners have not had access to the Manitoba market from the mid-1960s.[15] It can be expected that this decline in the market for refined sugar would have affected the relative market shares of each of the three refiners differently if these had been acting independently. In fact, it is evident that the contraction in the market available to the refiners did not affect their relative market shares.

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[14] C. Green, *op. cit.*, (1980), 185.

[15] *Atlantic Sugar refineries V the Attorney General of Canada* (1980) 45, 8960.

Secondly, in 1959 Redpath established a new sugar refinery in Toronto which almost doubled its output capacity. Thus, from 1959, Redpath had a locational advantage in Toronto and in most other markets in Ontario over the other refiners located in Montreal and St. John. If the three refiners in eastern Canada had been acting independently, it could be expected from this change that relative market shares would have changed in favor of Redpath. This was not the case. Market shares remained stable over the period considered.

Another economic change in the sugar refining industry occurred when Redpath pioneered the production of liquid sugar in Canada in the 1960s. Some evidence from court transcripts suggests that Redpath recognized the advantage it had over the other refiners with respect to the supply of liquid sugar. In 1969 Redpath stated in its annual marketing plan, "emphasis will be placed on liquid sugar because it is an area that competitors are weakest and the company is strongest".[14] However, despite this perceived competitive advantage, the relative market shares of each of these refiners remained stable.

Another and possibly the most important economic change in the sugar refining industry occurred in 1964 when Cartier entered this industry with a refining plant in Montreal.

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[14] *Ibid.*, (1980), 50, 10136.

Evidence from court transcripts in the *Atlantic Sugar* case suggests that this refiner achieved an initial market share of 1.1 percent of the eastern Canadian market for refined sugar which increased to 6.8 percent by 1968.[17] Other evidence in these transcripts suggests that over this period of time the market shares of Atlantic, Redpath and St. Lawrence changed each year in proportion to their historical market shares though much of the refined sugar of Cartier was sold to traditional customers of St. Lawrence.[18] The Crown concluded that the adjustment in market shares to maintain their traditional shares of the eastern Canadian market for refined sugar was a result of a market sharing agreement.

In summary, it may be expected that the changes in economic conditions which occurred between 1960 and 1973 would have destabilized the year to year market shares of Atlantic, Redpath and St. Lawrence if these refiners had made independent decisions on the amount of sugar refined and traded. The situation which existed in the eastern Canadian sugar refining industry appears to correspond to that predicted by the joint profit maximization model descibed earlier.[19] As was concluded by the trial Judge in the sugar court case, "... one would be very ingenuous not to be aware that there was and continues to be a tacit agreement...."[20]

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[17] *Ibid.*, (1978), Pleadings before the court of appeal, 32, 6394-6406.

[18] Ibid., 32, 6403-05.

[19] For a detailed discussion of this topic, see F.M. Scherer, *op. cit.*; D.K. Osborne, *op. cit.*; and M. Spence, *op. cit.*

As was alleged by the Crown in court during the *Atlantic Sugar* case, there is evidence which suggests that the apparent stability of market shares of Atlantic, Redpath and St. Lawrence from 1961 to 1973 was associated with lessening of market competition. This conclusion is inferred from a testimony of Mr. Shaw of Redpath to the trial court in 1975 who stated:

> When Cartier started in 1964, Redpath took the attitude that Cartier would not take any Redpath customer, that we would meet any prices that were offered by Cartier to Redpath customers.... Nevertheless, Cartier, not being successful against some Redpath customers, then went to other customers who bought from competitors; and they in turn started to cut against Redpath customers.... And at that time we realized we were in a reccurring situation of the nineteen-sixties, and we stopped and stepped aside. Well, we will reduce our share of the Canadian market by our share of the Cartier production. We would not go back any further.[21]

The Crown stated: "what Mr. Shaw is saying is that the Eastern Canadian market was divided among the big three with each having traditional customers." It seems that in the absence of new competitors, it was unlikely that the three big refiners would compete on the basis of price. The Crown argued that the price-cutting by Redpath had been aimed at undermining the competitive position of Cartier and "when it became apparent that this decision was in reality one to increase market shares, Redpath stepped aside." It can be concluded that stable market shares were associated with lessening of price competition in the eastern Canadian market for refined sugar since price competition would likely have destabilized established relative market shares as well as provoke a price war among Atlantic, Redpath and St. Lawrence.

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[20] *The Queen v Atlantic Sugar refineries et al.* (1975), *op. cit.*, 102.
[21] *Ibid.* (1978) 32, 6401- 02.

Another example of lessening competition is concerned with a feature of price discounting by these refiners. Evidence from several transcripts shows that in the 1960s, Atlantic, Redpath and St. Lawrence on occasions gave some limited price discounts to selected buyers of refined sugar. The evidence also shows that the discounts were a tool used by these refiners to regain traditional market shares. An officer of St. Lawrence Sugar testifying in court during the *Atlantic Sugar* case stated:

> If we were behind our target for the year we might be more aggressive in discounting to try and correct our position, and I expect when we find that other refiners are more aggressive than we are, then they are behind in some target they have set for themselves, and are trying to correct their position.... Sometimes we would give very small discounts to get business.[22]

As it was argued by the Crown, the limited and small price discounts to selected customers had the outward appearance of price competition. In the framework of the joint profit maximization model, these limited price discounts could be viewed as restricting price "cheating" by members of a cartel. As noted earlier, in the dominant firm price leadership model the leader determines the product price and the other firms follow. This model does not predict that small, limited price concessions would be given.

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[22] For more details, see *Ibid.*, (1978), 32, 6406-17.

All the three courts which rendered judgement in the *Atlantic Sugar* case (the trial court, the court of appeal and the Supreme Court of Canada) agreed that the maintenance of historical market shares by the accused refiners "was the result of a tacit agreement" between Atlantic, Redpath and St. Lawrence. However, the judgement of the trial court and the Supreme Court of Canada was that the agreement was not intended for the lessening of competition and the lessening of competition was not undue. These courts contended that the intent of the agreement was to avoid price wars between the refiners. The courts acquitted the refiners. Though the court of appeal agreed with the argument that the agreement to maintain fixed market shares may have been intended to avoid price wars, it was judged that illegal means had been used and competition was adversely affected. The Judge in the court of appeal stated:

> Manufacturers may legitimately seek a certain economic prosperity, but not by means of a commercial peace which is expressed by a prohibited act, that is the elimination of competition: Mr.Justice Taschereau of the Supreme Court, in *Howard Smith Paper Mills Ltd. et al.v. The Queen* (1957), 118 C.C.C.321 at 325, 8D.L.(2d) 449 C.P.R. 6 stated:
>
> "The public is entitled to the benefit of free competition, and the prohibitions of the act cannot be evaded by the good motives. Whether they be innocent and even commendable, they cannot alter the true character of the combine which the law forbids, and the wish to accomplish desired purposes constitute no defense....
>
> It is my strong view that the traders, manufacturers, and producers cannot, as the law stands, monopolize a substantial part of the markets of the country in given industries, to promote their own

> business interest... by saying to the Courts that the conspiracy was organized in order to achieve the stabilization of prices and production".[23]

It seems that the stance taken by the trial court and the Supreme Court of Canada focussed on intent and ignored the adverse effects on competition that appear to have resulted from stable market shares.

Mallen (1976) has argued that the long-run stability in market shares of Atlantic, Redpath and St. Lawrence was not due to collusion.[24] He also argued that stable market shares were compatible with effective competition. The argument was that a number of factors necessitated stable market shares of these refiners. One of the factors to which stable market shares was attributed was the stable demand for refined sugar in Canada. A second factor was the limited entry into and exit from the industry. Another factor which Mallen maintained had facilitated constant market shares without collusion, was the relatively homogeneous nature of refined sugar products. It was argued that threats of bitter price wars discouraged aggressive marketing policies which would have resulted in variable market shares from one year to another. However, as discussed earlier, conditions in the market for refined sugar appear to have changed considerably from 1960 to 1973 and yet the relative market shares remained stable.

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[23] *Ibid.*, (1978) 41 CCC2, 224-225.

[24] Bruce Mallen, "Collusion! Is Long Run Market Share Stability a Reflection: The Case of the eastern Canadian Sugar Refinery Industry 1960-1973," *The Business Quarterly Review* 41 (Summer 1976): 28-36.

Osborne (1976) and Spence (1978) have indicated that cartels tend to be stable primarily through deliberate maintenance of constant market shares by all members. It seems likely that Atlantic, Redpath and St. Lawrence attempted to maintain constant market shares as a means of lessening competition in the refining industry. Whether the lessening of competition was intended or not is difficult to assess from the available evidence. However, intended or not, the lessening of competition apparently reduced the level of economic efficiency considerably in the sugar refining industry.

Some Evidence on Market Exclusion

One feature which likely enhanced barriers to entry into the eastern Canadian market for refined sugar between 1960 and 1973 arose from exclusionary tactics of Atlantic, Redpath and St. Lawrence towards potential competitors. This section of the study presents evidence of market exclusion along with a discussion of the implications of this feature of market behavior for competition policy in Canada. Evidence from court transcripts concerning the *Atlantic Sugar* case indicates that from 1960 to 1974, a number of firms attempted to enter the market for refined sugar in eastern Canada.[25] Only two refiners successfully entered this market and their entry occurred after the Government of Canada intervened. The evidence indicates the application of several strategies by the three accused refiners to deter the entry of new firms into the eastern Canadian market for refined sugar.

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[25] These firms are outlined in the discussion below.

The main strategy was foreclosure of access to raw sugar. The evidence from court transcripts of the *Atlantic Sugar* case suggests that between 1960 and 1963, Robin Austin (the founder of Cartier) and Commonwealth Enterprises in Montreal (a business firm in Montreal) were denied access to refined sugar on the world market for import into Canada for direct sale to the trade. The evidence indicates that between 1951 and 1961, Robin Austin had imported refined sugar into Canada for direct sale to the trade.[26] Apparently, from 1961 onward, that form of sugar was not available to Austin for importation into Canada. The evidence on this from the transcripts reveals that Austin sought the assistance of Golodetz of London, an important international sugar broker, to obtain high quality sugar for importation into Canada. Golodetz replied to Austin stating:

> Two or three years ago we were suspected of having some interest in importation into Canada of Mexican whites, and then without making a proper check on the facts, we received warnings from Tate and Lyle on behalf of Canada and Dominion that our raw sugar business would suffer if participation of white sugar exports to Canada could be proved.
>
> In the circumstance we do not think we shall be able to cooperate with you, even if we can find sugar....

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[26] Robin Austin imported high quality sugar as a refiner, washed the sugar by a simple process (the process was simpler than refining) and sold the sugar mainly to food processors.

> In the face of the present and past strong opposition by Canadian refiners, we are disinclined to make sales through you of white sugar, either by direct offers or by some arrangement for indirect working with you.[27]

In 1974, the author of these letters testifying before the trial court reiterated:

> ... having been forty years in the sugar business... I knew very well that the refiners don't want people who deal with them offering white sugar.... It is ingrained in the people who negotiate such business.[28]

It can be inferred from the evidence that access to supplies of refined sugar by new firms through established brokers was limited.

Court transcripts also show that in 1962, India, which had not been a major exporter of raw sugar, had a surplus of refined sugar for export.[29] The evidence from the transcripts shows that officers from the Indian Sugar Mills Association (which handled the exports of sugar on behalf of the Government of India) visited Canada in an attempt to export substantial quantities of sugar to this country. Visits were made to all the refiners in eastern Canada, raw sugar brokers in Canada and some food manufacturers in Quebec and Ontario. During that time period, Robin Austin and Ram Mehra of Commonwealth Enterprises, independently attempted to import some of this sugar into Canada for direct sale to the trade.[30]

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[27] *The Queen v Atlantic Sugar Refineries et al.* (1978), Pleadings before the court of appeal, Montreal, 31, 6129-31.
[28] *Ibid.*, (1978), 31, 6123, 6130-31.
[29] *Ibid.*, (1978), 31, 6131-60.
[30] Evidence in the transcripts from the court case indicates that though the Indian sugar was refined (it polarized at 99.8 degrees or higher), it needed nominal refining to bring

The evidence from the court transcripts shows that the two firms negotiated independently with the Association in India to purchase sugar for importation into Canada. There is extensive information from the court transcripts which shows that several strategies were used by the refiners in eastern Canada to prevent the importation of that sugar into Canada.

One of these strategies was to threaten exporters of sugar in India with invoking of dumping duties on the sugar if it was imported into Canada for direct sale to the trade.[31] The evidence indicates that the imposition of dumping duties could have rendered these transactions unprofitable to the exporter and importer. The evidence also suggests that the threat was effective in preventing imports of sugar for direct consumption, even if the threat had been a ruse. It is evident that imports of sugar into Canada for direct consumption would have been in competition with sugar refined in Canada. The extent to which market competition could have increased can be inferred from a court transcript written by a representative of Woodhouse, Drake and Carey (an important sugar broker in London). The representative stated:

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[30](cont'd)it up to the standards of refined sugar in Canada. However, that type of sugar could be utilized by food processors, wineries and non-food manufacturers without further refining.

[31] Dumping duties are levied over and above the nominal customs duties if the product is considered to be dumped on a foreign market. For evidence with regard to sugar imports from India, see *Ibid.*, (1978), Pleadings before the court of appeal, Montreal, 31, 6138-44.

> If they are going to throw the whole manufacturing trade wide open to competition from Indian white sugar that could be quite a disaster to them. I would have thought if they slam the door tight shut on this Indian white sugar it should be quite a lot to them in the future.[32]

Evidence from the court transcripts reveals that in the same year (1962), the eastern Canadian sugar refiners purchased about 100 thousand tons of raw sugar from India.[33] The evidence from the transcripts suggests that the arrangement was that exporters of sugar in India agreed to only sell extra sugar to Canada to a consortium of the existing sugar refiners. The evidence reveals that this arrangement was enforced by appointing an exclusive sugar broker each year to handle all imports into Canada of Indian sugar. The exclusive broker then channelled the raw sugar to the three refiners. The evidence also shows that this arrangement worked well from 1963 to 1965. In 1966, the Indian Sugar Mills Association, Atlantic, and St. Lawrence violated the terms of the arrangement in this instance.[34] The evidence shows that on that occasion, Tate and Lyle of London threatened to block the sale of sugar from India into Britain.

Other evidence from transcripts of the court case concerning Atlantic, Redpath and St. Lawrence shows that in

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[32] *Ibid.*, (1978), 31,6143.

[33] Information from the court transcripts indicate that Tate and Lyle of London, several sugar brokers in Canada, New York and London, and the Indian Sugar Mills Association were involved in this arrangement. For further information, see *Ibid.*, (1978) 31, 6144-46; (1980) 50, 9991-39; and 52, 10529-30.

[34] *Ibid.*, (1980), 52, 10374-76.

1962 when India had surplus raw and refined sugar to export, Valia Brothers (Exporters and Importers) of India made inquiries to eastern Canadian refiners about the possibility of exporting sugar to these refiners in Canada. Apparently this firm was referred to Farr and Company (a Canadian sugar broker). The broker discouraged Valia Brothers from this trade, pointing out that sugar refiners in Canada preferred to deal exclusively with the Indian Sugar Mills Association, rather than with numerous exporters.

Another example of exclusion of potential competitors in the sugar refining industry, at least in eastern Canada, concerns Edwards Billington (a Canadian firm). The evidence shows that in 1962 this firm inquired from Hodgson (West India), a sugar broker in eastern Canada, about the possibility of exporting sugar to Canada for direct sale to the trade. Hodgson replied:

> It is a matter of policy of this company not to market any products that would be in competition to our refiners who are our main customers.... If you were successful in the marketing of sugar in Canada, it would be a very simple matter for any refiner here to put pressure on either Demerara or Barbardoes to stop you by virtue of purchasing large quantities of sugar from these origins where you wish to obtain your sugar.[35]

After failing to obtain supplies of sugar for importation into Canada for direct consumption, apparently

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[35] *Ibid.*, (1980) 50 9920. The court transcripts show that Hodgson (West India) Montreal was the exclusive representative of Woodhouse, Drake and Carey, London. The latter was also a member of the Committee which determined the London daily prices for raw sugar in London. See *Ibid.*, (1980), 52, 10396-97.

Robin Austin decided to establish the Cartier Sugar Refining Company in Montreal in 1963. The evidence from the court transcripts indicates that eastern Canadian sugar refiners, sugar brokers in Canada and their parent companies in London including Tate and Lyle, and some major suppliers of raw sugar to the world free market attempted to prevent Cartier having access to supplies of raw sugar for refining in Canada. The extent of the problems that Cartier faced in the procurement of raw sugar is suggested by the contents of a letter of a sugar broker in Quebec to raw sugar producers in South Africa in 1963. The broker stated:

> My first impression is that Robin Austin will have difficulty obtaining sugar from most sources of supply. You can well imagine that any sources (including Rhodesia) that has Tate and Lyle influence will shun any dealings with him.... I think it is unlikely that any others with the possible exception of India would deal with him. Even India is doubtful as Czarnikow-Rionda handles sugar through Czarnikow Montreal. So that leaves South Africa.
>
> .... Joe Whitmee said they would do nothing about it at present. However, once he was in business, they would take steps. Obviously meaning price cutting.[36]

As discussed earlier, sugar imports into Canada from India for direct sale to the trade had been restricted by the existing eastern Canadian refiners from 1961. It was previously noted that, in the 1960s, Indian raw sugar imports into Canada were channelled exclusively through established Canadian sugar refiners. This, apparently, denied Cartier access to raw sugar from India. In the case of imports from South Africa, the court transcripts suggest that some arrangement was made for the established sugar refiners in eastern Canada to buy about 100 thousand tons of raw sugar per year, between 1963 and 1966, from South Africa, provided that these exporters would not sell raw sugar to potential competitors.[37]

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[36] *Ibid.*, (1980), 50, 9908. In the 1960s, Joe Whitmee was then director and managing director of Tate and Lyle and Redpath Sugar, respectively.

It is worthy of note that evidence from the court transcripts shows that the exporter of raw sugar in South Africa had agreed to supply Cartier with 30 thousand tons of raw sugar annually, for five years. It seems evident that it was immediately after consulting with the eastern Canadian refiners that this sugar exporter cancelled the deal with Cartier. A court transcript of a cable from a representative of the sugar exporter in South Africa to Cartier read as follows:

> Estimated position for 1964 which has diminished since our discussion... makes definite allocation this stage impossible. In principle Association would prefer consider Canada contracts as a whole and not individually in order to ensure equitable allocation all buyers.[38]

It is inferred from this information that Cartier's access to the supply of raw sugar from South Africa was foreclosed. The objective was to deter the entry of Cartier into the Canadian sugar refining industry.

More evidence from the court transcripts in the sugar case (1974 to 1980) indicates that Atlantic threatened to boycott the purchase of raw sugar from any sugar broker or exporter who sold raw sugar to Cartier. It is inferred from this evidence that Atlantic attempted to deter the entry of Cartier by foreclosing access to supplies of raw sugar and to established channels (brokers) for importing sugar. Testifying before the Restrictive Trade Practices Commission in 1971, Robin Austin claimed that other tactics which had been used by the refiners to deter his entry into the refining industry included blocking of financing and sabotaging cargoes of raw sugar.[39] As was indicated earlier, between 1969 and 1974, Robin Austin and Westcane each planned to build new sugar refineries at Cornwall and Oshawa, respectively. Some limited evidence from the court transcripts indicates that Atlantic sought the assistance of Salter Hayden (an influential senator in Canada at that time and also a co-director of Atlantic Sugar) in an attempt to deter the entry of each of Westcane and Robin Austin into the refining industry. As was argued by the Crown in court, it was hoped that the senator would "nip the two planned refiners in the bud".[40] The Crown argued that it was after failing to deter the entry of Westcane, that Atlantic and Redpath each proposed a joint venture in the planned refinery of Westcane. Testifying before the trial court in the sugar case in 1975, a former president of Atlantic Sugar stated, "The conclusion was that we can't stop them maybe we can join them."[41]

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[37] *Ibid.*, (1980) 50, 9925.
[38] *Ibid.*, (1980), 50, 9925, 10020.

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[39] *Ibid.*, Draft Statement of Evidence, 255-271; and also see W.T. Stanbury and G.B. Reschenthaler, op. cit., (1977): 652.
[40] *Ibid.*, (1978) 31, 6314; and Idem, (1980), Pleadings before the Supreme Court of Canada, 47, 9417. Also see the note by W.T. Stanbury and G.B. Reschenthaler, *op. cit.*, (1977): 652.

The information outlined above suggests that, between 1960 and 1973, the importation of sugar into Canada for refining or for direct sale to the trade was under strict surveillance by the eastern Canadian sugar refiners, sugar brokers in Canada and London and from Tate and Lyle in London and its subsidiaries in several parts of the world. It seems evident that in the 1960s and in the early 1970s, these groups adopted aggressive strategies which discouraged or deterred potential exporters, refiners, and importers entry into the Canadian market for refined sugar. It appears that potential sugar refiners, suppliers, or importers must overcome major barriers to entry associated with features of market conduct of existing refiners, brokers, and suppliers of raw sugar to Canada. To the extent that exclusionary tactics used by the existing refiners seem to have limited entry not only of new refiners, but also of importers and suppliers of refined sugar, this feature was related to the high levels of concentration in the Canadian sugar refining industry for the period of time from 1960 to 1973.

An additional tactic which may be associated with the exclusion of new entrants and the continuing high levels of concentration in the Canadian sugar refining industry is the maintenance of considerable excess capacity in this industry. As outlined in Chapter VI, from 1963 to 1975 the refining industry operated at a low average capacity.

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[41] *Ibid.*, (1978) 32, 6438.

Capacity utilization was about 70 percent. This feature of excess capacity can be viewed as a barrier to entry in this highly concentrated industry.

Cohen and Cyert (1975, p. 234) have stated that the existence of excess capacity makes an industry appear unattractive to potential entrants. Caves and Porter (1977, p. 245) and Wenders (1971, p. 14-19) have shown that unused capacity encourages established firms to engage in predatory practices against new entrants. That is, established firms may use excess capacity to increase output at lower marginal costs than new firms and lower prices to undermine new entrants. It seems likely that the extensive excess capacity in the Canadian sugar refining industry posed a substantial barrier to entry in this industry.

The three courts did not find any wrong-doing associated with the exclusionary activities of the refiners. These courts argued that there was not enough evidence to show that this pattern of market conduct had been a result of an agreement among the refiners. However, as was outlined earlier in this chapter, it is evident that competition in the market to supply raw sugar to Canada and in the market for refined sugar in Canada, suffered due to the exclusionary strategies of the three refiners. This pattern of market conduct is likely to have denied consumers in Canada the benefits of free competition.

As was recommended by the Director of Combines Investigation and Research (1981) concerning the petroleum industry, the Combines Investigation Act should be amended to prohibit exclusionary practices adopted by a dominant firm or more firms that are part of a group of firms that are dominant.[42] Such an amendment could prevent firms from following parallel exclusionary behavior which can have decisive adverse effects on competition.

Some Evidence on the Pricing Mechanism for Refined Sugar in Canada

Another major issue which was considered by the trial court and court of appeal[43] during the *Atlantic Sugar* case was the procedure used by Atlantic, Redpath and St. Lawrence in the pricing of sugar in eastern Canada. It was argued by the Crown that the procedure for pricing sugar had lessened competition in the eastern Canadian market for refined sugar and substantially enhanced prices of refined sugar to consumers in Canada. In this section, the procedure for pricing refined sugar by the eastern Canadian refiners between 1960 and 1973 is described. Since the pricing of refined sugar in Canada is based on the London daily prices of raw sugar, a brief outline of the purchasing and pricing of raw sugar by the importers (refiners) in Canada is presented. A discussion of the effects of this procedure on the level of prices and profit margins earned by the refiners is also given. The main source of data for this section is again court transcripts from the *Atlantic Sugar* case.

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[42] James Lorimer, *Canada's Oil Monopoly: The Story of the $12 Billion Rip-off of the Canadian Consumers* (Toronto: James Lorimer and Co. Publishers, 1981), 124.

[43] The Supreme Court did not consider this allegation as it had been settled in the lower courts.

Between 1960 and 1973, importers of raw sugar into Canada purchased raw sugar on contracts through sugar brokers in this country. The contracts, which were of two types, specified in detail the terms of the sale (the pricing of raw sugar, quantity purchased, shipping conditions, delivery date and insurance). The two types of contracts were those which applied to a specified price for sugar and those which involved deferred pricing for sugar sales. Information reported by the Tariff Board (1971) and Longmuir and Hewston (1982) suggests that from about 1959 onward, much of the raw sugar imported into Canada was purchased on deferred pricing contracts.[44]

The purchase of sugar on deferred pricing contracts involved determining the cost of raw sugar to the refiner on the day the sugar was refined rather than on the day the contract of purchase was prepared. The main advantage of this procedure to the refiner was that it eliminated the risk of any changes in the price of raw sugar between the date of purchase and refining of the raw sugar. Evidence from court transcripts in the *Atlantic Sugar* case and from Longmuir and Hewston shows that the basis for pricing raw sugar by Canadian refiners on the day it was refined was the

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[44] Tariff Board, *op. cit.*, 47-52; and N. Longmuir and G. Hewston, "Price Formation and Price Movements for Sugar," *Food Commentary* 4 (June 82): 34.

London daily price (hereafter referred to as L.D.P.).[45] The L.D.P. was determined daily by a committee of five sugar brokers in London. The committee set the L.D.P. (which included freight rates and insurance of the sugar from the exporting country to London) on the basis of the price at which raw sugar had been purchased on that day on the London Sugar Terminal market. Two members of the committee testifying during the *Atlantic Sugar* case in 1975 stated that, in practice, the L.D.P. represented either the price at which Tate and Lyle purchased sugar on a spot basis on the London Sugar Terminal market on that day, or on the previous day.[46] They also stated that if Tate and Lyle had not purchased any sugar, the L.D.P. would be an estimate made by the committee based on prices of raw sugar on the London Sugar Terminal market or on the futures market. The refiners then added $0.75 per 100 pounds of raw sugar to the L.D.P. This was the preferential margin which Canadian importers remitted to suppliers of raw sugar from British preferential countries. Other costs which were added included freight, insurance, handling and import duty. Finally, a profit margin was added, thereby arriving at a price for refined sugar at the factory gate.[47]

Formula pricing of refined sugar by the Canadian refiners was of concern to the Crown. It was argued by the

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[45] *The Queen v Atlantic Sugar Refineries et al.* (1978), Pleadings before the court of appeal, Montreal, 32, 6343.
[46] *Ibid.*, (1978), 32, 6344-51.
[47] *Ibid.*, (1976), Draft Statement of Evidence, 62-64.

Crown during the *Atlantic Sugar* case that Canada had been one of the few main world markets for "free" raw sugar.[48] However, the Canadian refiners agreed to use the L.D.P. which did not take directly into account the price of raw sugar sold to Canadian refiners. The Crown contended that the actual prices paid for raw sugar by the Canadian refiners were lower than the L.D.P. and varied from one refiner to another.[49] The Crown doubted the validity of the L.D.P. as a basis for pricing refined sugar in Canada. The Crown concluded that the adoption of the L.D.P. by Canadian refiners provided a daily index which became part of an agreed formula, between the refiners, in the pricing of sugar in Canada.

The Crown also questioned the validity of incorporating the $0.75 in the pricing formula when in fact on occasions the preferential margin remitted to exporters of raw sugar was lower. Evidence from the court transcripts in the sugar court case show that in 1962 the Indian Sugar Mills Association (the sole exporter of raw sugar from India) sold substantial quantities of raw sugar (100 thousand tons) and agreed to take lower preferential margins, ranging from about $0.25 to $0.65 per 100 pounds of raw sugar.[50] There is also ample evidence from the court transcripts which indicates that, in the 1960s and early 1970s, exporters of raw sugar in South Africa also allowed substantial private discounts on the L.D.P or on the preferential margin to importers of raw sugar in eastern Canada, while the refiners continued to use the L.D.P. and the $0.75 in the pricing formula.[51]

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[48] As was discussed in Chapter II, "free" raw sugar is that sugar which moves in international trade without special trade arrangements between importing and exporting countries.

[49] *Ibid.*, (1978), 32, 6343-51.

[50] *Ibid.*, (1978) 32, 6440; (1980) 49, 9856; (1980) 51, 10318-20.

Another concern about the formula pricing was that, apparently due to this method of pricing refined sugar, prices of refined sugar of Atlantic, Redpath and St. Lawrence were essentially identical between 1960 and 1973. Atlantic and St. Lawrence stated in their testimony to the trial court that in addition to formula pricing of refined sugar, they constantly obtained information about prices Redpath charged for sugar from either a telegram company, sugar brokers, or customers in eastern Canada and matched these prices.

It is difficult to conclusively establish whether the consistently standard procedure for pricing refined sugar in eastern Canada and identical prices in the 1960s and early 1970s were due to price leadership without collusion, market collusion, or to both of these conduct patterns. Stanbury and Reschenthaler (1977) concluded that identical price lists of each of the refiners was due to conscious parallelism.[52] They argued that in a highly oligopolistic industry, collusion was unwarranted since other refiners would follow the price set by the dominant firm (Redpath). Even then, the adoption of the standard procedure of pricing refined sugar (using predetermined rather than actual costs) can be viewed as conscious efforts by these refiners to facilitate the communication of price information.

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[51] *Ibid.*, (1980) 37, 7304-66; and (1978) 32, 6451-52, 6463.
[52] W.T. Stanbury and G.B. Reschenthaler, op. cit., 649.

A number of related factors suggest that because of the standard formula for pricing refined sugar, allocative efficiency suffered. Considering that refining costs for the different refiners may well have been different (Tariff Board, p. 30-34) one would expect differences in costs to be reflected in the differences in the prices for refined sugar. In a competitive market, it would be expected that savings in costs would be passed to consumers in lower prices, since price reflects marginal costs. Firms having higher costs would either be eliminated from the industry or would try to reduce the costs of production to remain competitive. Apparently, in the case of the eastern Canadian sugar refining industry, refiners with lower costs must have transformed savings in costs into profits.[53]

Second, evidence from the court transcripts in the *Atlantic Sugar* case and the arguments of the Crown, suggest that between 1967 and 1972 the price discounts on imports of raw sugar were so large that the three refiners concealed related profits by arranging inflated transfer prices for raw sugar by their offshore subsidiaries.[54] The enhancement of prices to Canadian consumers can be inferred from a court transcript of a statement made by a representative of Redpath during the formation of the Albion Company Limited of Bermuda in 1967. It was stated:

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[53] *Ibid.*, (1978) 32, 6440-53; (1980) 37, 7304-66; 49, 9856; and 51, 10318-20.

> The raw sugar purchasing department has from time to time, the opportunity to purchase cargoes at substantial discounts. These discounts are now taken as profits in the raw sugar department and are subject to Canadian income tax. If the Bermuda Corporation were the buyers of such cargoes they could in turn sell the cargo to C and D at market prices, taking the discounts as its profits....[55]

The Crown examined the financial statements of Albion for the period of time from 1967 to 1971. It was estimated that the gross profits arising from this transfer pricing of raw sugar by Albion were about $7.5 million dollars over this period of time.[56] The procedure of pricing raw sugar via offshore subsidiaries was apparently intended to conceal excess profits, standardize costs of raw sugar and hence of refined sugar in Canada, and reduce taxes. It can be concluded that this procedure lessened price competition in Canada since it facilitated the identical price lists for Atlantic, Redpath and St. Lawrence.

Another aspect that has been of concern to economists is the issue of the base point pricing system used by all

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[54] Between 1967 and 1972, Atlantic, Redpath and St. Lawrence each established Berlantic Enterprises of Bermuda, Albion Company Limited of Bermuda and Midalta Limited of Bermuda, respectively. These were the subsidiaries that facilitatetd transfer pricing, see *Ibid.*, (1978), 32, 6446-61.

[55] *Ibid.*, (1978) 32, 6446.

[56] *Ibid.*, (1978) 32, 6453.

Canadian refiners. It was reported by the Tariff Board (1971) and court transcripts from the *Atlantic Sugar* case indicate that the pricing of refined sugar in different markets in Canada was on the base point pricing system from 1960 to 1973.[57] In the 1960s and early 1970s, the base points were Montreal, Toronto, St. John and Vancouver. Under this system all refiners received the same price for refined sugar delivered in any one particular market. That is, delivered prices were identical. The delivered price of all refiners to a specified customer location was determined as the factory gate price of the supplier nearest to a customer location plus rail freight rates from that base point to the purchaser. For example, the price of sugar in Winnipeg would be determined as the price of refined sugar in Montreal (the nearest base point) plus the cost of transporting refined sugar by rail from Montreal to Winnipeg, even though sugar consumed in Winnipeg was from the refinery at Fort Garry.

In general, rigid adherence to a system of base point pricing can have undesirable economic effects. One possible adverse effect is that price competition is essentially eliminated. As stated by Scherer (1970) there are losses in economic efficiency arising from cross-hauling and the use of non-optimal modes of transportation.[58] As was argued by the Crown in court during the *Atlantic Sugar* case, the base point pricing system may have been an important tool of facilitating covert collusion between the refiners.

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[57] Tariff Board, *op. cit.*, 52-59; and *The Queen v Atlantic Sugar Refineries et al.* (1978), Pleadings before the court of appeal, Montreal, 32, 6418-21. For a more detailed discussion of the theory of base point pricing system, see F.M. Scherer *op. cit.*, 262-272.

In conclusion, it appears that, in comparison to the outcome of "workable competition", the pricing of refined sugar in eastern Canada in the 1960s and in the early 1970s was unsatisfactory.[59] There is no indication that this situation has changed. First, as was argued by the Crown during the court case, the validity of using the London daily price as a basis for pricing refined sugar in Canada is dubious. As was indicated above, at times sugar refiners were able to purchase raw sugar at prices lower than the London daily prices. Secondly, the existence and use of a fixed preferential margin of $ 0.75 per 100 pounds of raw sugar in the determination of prices of refined sugar in Canada does not imply a competitive and efficient market. The evidence cited above suggests that the uniform method of pricing refined sugar likely was an act of covert collusion rather than of that of the dominant firm price leadership model. Whatever the case, the fundamental issue is that undesirable economic consequences seem to have resulted from the common policies followed by the refiners in the pricing of sugar in Canada. It is very likely that market competition and the levels of allocative efficiency suffered.

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[58] F.M. Scherer, *op. cit.*, 270-272.

[59] "Workable competition" exists in an industry when each firm in that industry makes independent decisions and when there is some uncertainty about the reaction of competitors (Scherer, (1970), 37).

The trial court and the court of appeal acquitted the refiners on the charge of conspiring to enhance unduly the prices for refined sugar in Canada. These courts contended that if there had been price enhancement, this had not been a result of market collusion. It was argued by the lawyers of the accused that identical prices had been a result of conscious parallelism. The court also contended that the siphoning of excess profits to offshore companies was intended to evade income tax and not to enhance prices of sugar in Canada. The decision to acquit the refiners was based on the provisions of the Combines Investigation Act which is directed against overt fixing of prices.

In view of the evidence noted in this chapter it is most probable that Atlantic, Redpath and St. Lawrence made conscious attempts to co-ordinate their decisions on market shares, exclusionary practices and the pricing of refined sugar in eastern Canada. It appears that competition was substantially and adversely affected by the refiners' standard market behavior.

As has been suggested by a number of economists, anticombines law should be reformed to limit patterns of market conduct arising from conscious parallelism, especially when these lead to adverse economic effects. As is recommended in the "Second Stage" of the proposed changes to the legislation, there is need to amend the anticombines law to cover monopolization and joint monopolization practices arising from conscious parallelism and misuse of dominant market power by one or more firms.[60] The Director of Combines and Investigation Act proposed that civil provisions be incorporated in the law to prevent patterns of market conduct (of dominant firms, individually or as a group) which adversely affect the level of market competition and economic efficiency. Such reforms would lead to more effective competition policy which could be applied to increase competition and thus, the level of economic efficiency in the Canadian industrial and service sectors.

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[60] Monopolization in this context refers to a dominant firm in an industry that acts as if it is a monopolist. Joint monopolization refers to a number of firms with substantial market shares that follow parallel practices and therefore act as if they are a monopolist. For a more detailed discussion of these proposals, see Canada, Dept. of Consumer and Corporate Affairs, *op. cit.*, (March 1977), 45-49. For a more recent and critical discussion of the Director's proposed amendments to deal with conscious parallelism and some undesirable features of market structure and conduct see W.T. Stanbury and G.B. Reschenthaler, *op. cit.*, (Sept. 1981): 394-437; *Idem*, (winter 1981): 839-869; and *Idem* , (1977): 685-700.

V. A REVIEW OF LITERATURE ON ALLOCATIVE EFFICIENCY

A. Introduction

This chapter contains a review of some theoretical concepts and selected studies of allocative efficiency as an aspect of market performance. These concepts will be applied to the analysis of the sugar refining industry in Chapter VI.

French (1977) reviewed concepts of economic efficiency and approaches to the measurement of the levels of efficiency of agricultural marketing systems.[1] Two broad concepts of economic efficiency in marketing are technical and allocative efficiency. An approach to the measurement of technical efficiency includes the evaluation of the relationship between output and inputs. A technically efficient firm (industry) produces the maximum output for a given set of inputs, subject to a given technology. Other approaches to the measurement of the levels of technical efficiency include the evaluation of economies of scale, utilization of plant capacity, technological progress and other features which minimize the general level of average costs of production. Some of these topics have been discussed in the earlier part of this study and literature related to these is not reviewed in this section which focuses primarily on allocative efficiency.[2]

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[1] B.C. French, *op. cit.*, 93-97.

[2] For a detailed discussion of approaches to the measurement of technical efficiency, see R.G. Bressler and R.A. King, *Market Prices and Interregional Trade* (Toronto: John Wiley and Sons, 1970), Chapter 21; P.A. Yotopoulos and J.B. Nugent, *Economics of Development: Empirical Investigations*

One approach to the measurement of allocative efficiency involves an assessment of intermarket price relationships in space, time and form dimensions. Another closely related approach involves an assessment of the level of profit rates in an industry. Another approach involves an estimation of social costs attributable to substantial market power.[3] Another concept of economic efficiency, essentially related to technical efficiency, has been referred to as "x-efficiency". This is the minimization of total costs of a firm by using the most improved technologies and skills available to the firm. X-inefficiency arises in imperfectly competitive industries because there is lack of competitiveness which would induce firms in those industries to adopt improved technologies.[4] The concept of x-efficiency is not explicitly examined in this study due to data limitations. The focus in this chapter is on approaches to the measurement of allocative efficiency in the agriculture and food industries.

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[2] (cont'd)(New York: Harper and Rowe, 1976), Chapter 5; and P.C. Timmer, "On Measuring Technical Efficiency", *Food Research Institute Studies* 9 (1970): 99-171.

[3] Strictly speaking, this approach measures both technical and allocative efficiency. This is so if deadweight social loss (loss in allocative efficiency), excess capacity and suboptimal plant sizes (loss of technical efficiency) are considered in the assessment.

[4] The concept was first used by Leibenstein in 1966, see H. Leibenstein, "Allocative Efficiency V X-Efficiency", *AER* 56 (June 1966): 392-415; and Idem, "X-Efficiency: From Concepts to Theory", *Challenge* (Sept./Oct. 1979): 13-22.

B. Economic Theory and Some Empirical Studies Related to Intermarket Price Relationships

Economic Theory of Intermarket Product Prices

One approach to the assessment of allocative efficiency involves the evaluation of the extent to which product prices in space, form, and time dimensions approximate the product prices which would be predicted from a competitive market model. Theory predicts that product prices in perfectly competitive markets are interrelated in space, form and time dimensions by the costs of transporting, manufacturing and storing of a product, respectively, other things being equal.[5] Further, the model assumes that unit costs of these marketing services are minimized in a competititve environment. Minimization of costs and a high level of correlation between product prices in space, form and time dimensions imply a high level of allocative efficiency.

Some Empirical Studies on Price Relationships

Tomek and Robinson (1977) have reviewed extensively literature on price relationships at different stages of the marketing systems and at different points in space, and time.[6] Most of the studies reviewed by Tomek and Robinson have focussed on the relationships between prices at the farm level and those at the wholesale and retail levels.

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[5] R.G. Bressler and R.A. King, *op. cit.*, Chapters 5-9.

[6] William G. Tomek and Kenneth L. Robinson, "Agricultural Price Analysis and Outlook", in Lee R. Martin, *A Survey of Agricultural Economics Literature 1* (Minneapolis: University of Minnesota Press, 1977), 36V-389.

Among the questions the studies they reviewed sought to answer have been whether or not changes in farm prices are promptly and fully reflected in retail prices, whether margins are above normal and whether changes in margins influence farm and retail prices. These authors concluded that in general, while the analysis of price relationships (at least in spatial markets) have provided a logical basis for estimating the geographical structure of prices, there have been some shortcomings with this approach. They claimed that the squared correlation coefficients between actual and expected prices have been less than 0.5. They observed that these low correlations may be evidence of imperfections in the pricing system or they may be due to the unrealistic models and inadequate data. Tomek and Robinson concluded, in part, that the adequacy of a spatial model must be judged relative to the problem under study.

The studies on product price interrelationships selected for review here include those by Hassler (1953), Trierweiler and Hassler (1971), Lele (1967) and Tomek (1980).[7]

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[7] James B. Hassler, "Pricing Efficiency in the Manufactured Dairy Products Industry", *Hilgardia* 22 (Aug. 1953); John E. Trierweiler and James B. Hassler, "Measuring Efficieny in the Beef-Pork Sector by Price Analysis", *Agric. Ec. Res.* 23 (Jan. 1971), 11-17; Uma J. Lele, "Market Integration: A Study of Sorghum Prices in Western India", *Journal of Farm Economics* 29 (Feb. 1967), 147-159; and William G. Tomek,"Price Behavior on a Declining Terminal Market", *American Journal of Agricultural Economics* 62 (Aug. 1980), 434-444.

Hassler (1953) analysed the level of pricing efficiency in the dairy products industry by comparing expected and actual prices of manufactured dairy products in the United States over space, form and time dimensions. He first estimated the base prices of products in space, form and time dimensions. Next, he estimated the costs of transporting, manufacturing and storing the various dairy products. Third, he computed the expected product prices in space, form and time dimensions by summing the unit base product prices and costs of transporting, manufacturing and storing the product. Finally, he employed the procedure outlined below to assess allocative efficiency in spatially separated markets.

First, specific cities in the midwest United States (which was the major area of supply of dairy products) were chosen as base points. Second, major wholesale terminal markets which included Chicago, New York, Boston, Philadelphia, San Francisco and Los Angeles were selected. Product prices in the supply and terminal markets and transportation costs between supply and terminal markets were obtained. Expected product prices in terminal markets were computed as the base point prices paid to processors of dairy products plus the appropriate transportation costs. Actual and expected product price differences between manufacturing and terminal markets were calculated. The price interrelationships of dairy products between spatially separated terminal markets were also assessed. The results showed that differences between actual prices in primary and terminal markets exceeded the expected differences between product prices between these markets. Hassler concluded that relative price integration between the supplying and terminal markets and within terminal markets was consistently high, if quality differences were taken into account. He also concluded that the geographical structure of prices of dairy products manifested reasonable efficiency in the industry. It was noted that some slight distortions in product prices were due to variables which might be unquantifiable and might not be determined.

The study demonstrates both the usefulness and limitations of the normative approach to the measurement of allocative efficiency. Adequate knowledge of supplier and terminal markets, costs of marketing services (transporting, processing and storing), product quality differences, and marketing regulations are important for an accurate assessment of allocative efficiency of a market. Further, large differences in freight rates due to differences in modes of transportation, subsidization, and less efficient transportation systems reduce the usefulness of this approach. Opposing the above arguments, the approach can be useful where product and transportation systems are reasonably homogeneous.

Trierweiler and Hassler (1971) analysed price relationships for both beef and pork, at different stages of the marketing system from the farm to the consumer, in the

United States from 1957 to 1967. The objective was to evaluate specific price relationships within these sectors and to delineate areas of inefficient production and marketing. The stages of the market for which prices of different grades of animals or meat were analysed included the feeder, slaughter, wholesale and retail markets. A simple regression model adopted for the analysis was of the form:

$$P_1 = a + bP_2 + cW + V \text{ ----------- } (V-1)$$

Where:

P_1 denoted the product price at a lower stage in the marketing system;

P_2 denoted the price of an equivalent quantity of the product at a higher level in the marketing system;

W denoted the wage rate; and

V denoted the error term.

The statistical significance of the coefficients and other statistical tests were used to assess the strength of the price interrelationship and hence the level of pricing efficiency. There are several shortcomings to this approach. In particular, high correlations between product prices at different stages of the marketing process might not be indicative of a high level of pricing efficiency unless the costs of the marketing functions are minimized. In addition, they might simply indicate the presence of a constant monopoly markup rather than marginal cost pricing.

Lele (1967) analysed regional intermarket price relationships for sorghum in India. The model used in the study was basically similar to that used by Hassler which is outlined above. An analysis of market price relationships between primary (farmers') and terminal (wholesale) markets was made. Expected sorghum prices in terminal markets were computed as prices of sorghum in primary markets plus costs of marketing services. The analysis of the relationships of sorghum prices between spatially separated terminal markets and between expected and actual prices in specific terminal markets was based on correlation coefficients. Prices of sorghum in primary and terminal markets and between terminal markets were highly correlated. Similarly, expected and actual prices of sorghum in terminal markets were highly correlated. Lele concluded that most markets for sorghum were price-efficient. In cases where markets appeared to be inefficient, Lele identified certain government regulations, quality differences and a lack of adequate transportation facilities which inhibited the flow of sorghum between markets, as the main sources of inefficiency. Lele argued that the analysis of price interrelationships is a useful approach to the evaluation of the level of marketing efficiency. However, an adequate knowledge of product flows, costs of marketing services, available market infrastructure and government marketing regulations is important in assessing the level of allocative efficiency by this approach.

Tomek (1980) examined the relationships between prices for choice steers in three terminal markets (Omaha, Denver and Sioux City).[8] The approach taken was to compare price levels and first differences of prices in those markets. The model used in the comparison was:

$$P^1_1 - P^1_2 = a + b(P^2_1 - P^2_2) + V \text{ ----------- } (V\text{-}2)$$

Where:

Subscripts denote the time periods 1 and 2; while

Superscripts denote markets 1 and 2;

P^1_1 denoted the price of a product in market 1 in the current time period 1;

P^1_2 denoted the price of the same product in market 1 in the previous time period 2;

P^2_1 denoted the price of the same product in market 2 in the current time period 1;

P^2_2 denoted the price of the same product in market 2 in the previous time period 2; and

V denoted the error term.

In this analysis, movements of the price levels between different primary markets, terminal markets and between primary and terminal markets were evaluated. The estimated coefficients of the independent variables were taken as indications of the nature of the price relationships between these markets. An estimated slope coefficient which was close to one together with a high coefficient of determination (R-squared) were assumed to be indicative of a high degree of precision in the establishment of prices in these terminal markets. The results indicated that the level of pricing efficiency was high and was influenced by the volume of sales in each terminal market. Tomek discussed some problems which might bias the results. The main one was whether the prices of steers traded on these terminal markets were representative of all the prices of steers traded in the whole country. This author observed that if the volume of steers traded outside the terminal markets was substantial, then a high degree of correlation might not be indicative of a high level of allocative efficiency.

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[8] William G. Tomek, *op. cit*,

In summary, one approach to the measurement of allocative efficiency is to analyse the relationships between product prices in space, form and time dimensions. As was observed by Lele (1967), knowledge about a marketing system with respect to the nature of product mix, infrastructure, government regulations and the structure of freight rates is also important for the assessment of allocative efficiency of a marketing system using the approach considered above.

C. Theory and Empirical Studies Related to Assessing Social Costs due to Market Power

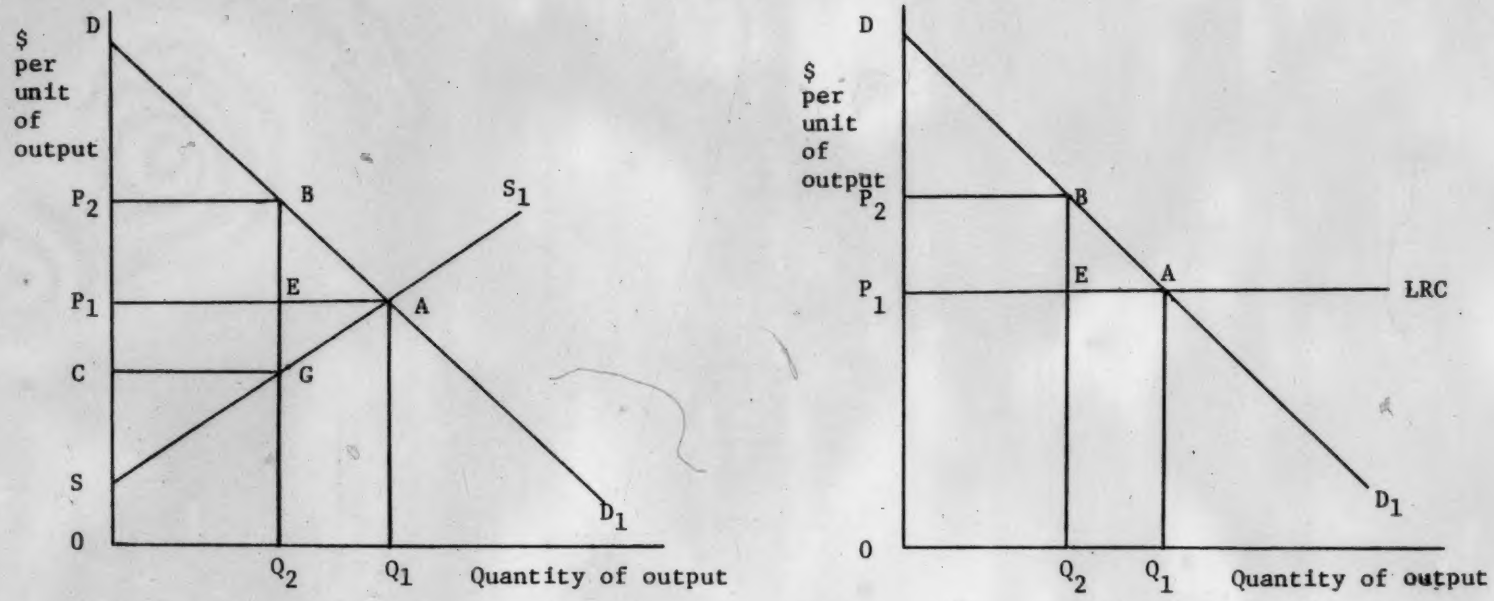
Theory of Social Costs of Substantial Market Power

The exertion of market power by firms in an industry to achieve higher price levels and restrict output has certain social costs for the economy. These costs can be classified into three components. One cost component is associated with the deadweight social losses (net effect on consumer and producer surplus). A second cost component associated with excess capacity arises if variable resources not employed due to restricted output are not productively used elsewhere in the economy or result in some distortion in resource use in other sectors. A third type of cost may include such factors as x-inefficiency and any costs of protecting the market power of the oligopolists. In addition there are losses in consumer surplus and increases in producer surplus arising from transfer of surplus from consumers to producers.

Figures V-1a and V-1b provide a framework for estimating losses in consumer surplus and increases in producer surplus caused by exertion of market power by producers. Figure V-1a is the general framework depicting downward and upward sloping demand and supply curves (DD,

FIGURE V-1

Components of Losses in Consumer and Producer Surplus Due to Exercise of Market Power by Producers


$
per
unit
of
output
D
P_2
P_1
C
S
0
B
E
A
G
S_1
D_1
Q_2
Q_1
Quantity of output
D
P_2
P_1
0
B
E
A
LRC
D_1
Q_2
Q_1
Quantity of output

(a) (b)

and (SS_1), respectively.[9] Figure V-1b depicts the framework for estimates of losses in consumer surplus presented in Chapter VI of this study. This follows the approach of Scherer (p. 401) and Parker and Connor (p. 628). In Figure V-1b the long-run supply curve (LRC) is horizontal rather than upward sloping.

In both Figures V-1a and V-1b the equilibrium price and quantity under perfect competition are depicted by P_1 and Q_1, respectively. Consumer surplus under competitive market conditions is denoted by the areas DAP_1.[10] The exercise of market power by producers causes a price increase from P_1 to P_2 and output is reduced from Q_1 to Q_2. It follows that, in both Figures V-1a and V-1b reduction in consumer surplus is denoted by the area P_1P_2BA. This reduction in consumer surplus has two components: the transfer of incomes from consumers to producers denoted by the area P_2P_1EB and the deadweight social loss in consumer surplus represented by the area ABE. There may also be social costs which are not depicted in Figures V-1a and V-1b. These include higher costs associated with excess capacity, lags in adopting new technologies and other costs of protecting oligopolists' positions (Scherer, p. 405-408; and Parker and Connor, p. 628).

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[9] It is assumed that the ordinary demand and supply curves approximate the Hicksian compensated demand and supply curves. (If these coincide the estimated consumers' and producers' surplus is exactly equal to the consumers' and producers' compensated variation, respectively). This assumption implies that the "income effect" resulting from a change in the price of a commodity is small and the marginal utility of money is constant for all individuals. Further, the income elasticity of demand is small. For a detailed review of the theory of economic surplus and its use, see J.M. Currier, J.A. Murphy, and A. Schmitz, "The Concept of Economic Surplus and its Use in Economic Analysis," *The Economic Journal* 81 (Dec. 1971): 741-99. Also see Robert Willig, "Consumer's Surplus Without Apology," *American Economic Review* 66 (Sept. 1976): 589-97.

[10] Consumers' surplus is denoted by the area above the price line P_1A and below the demand curve DD_1.

The deadweight social loss in consumer surplus can be estimated by the following formula:

$$dwl = (0.5)(P_2 - P_1)(Q_1 - Q_2) \text{ -----------------(V-3)}$$

Where:

$P_2 - P_1$ denotes the price rise due to market power; and

$Q_1 - Q_2$ denotes the reduction in output due to market power.

As shown by Scherer (1970), this area has been approximated by the formula:[11]

$$dlw = (0.5)(t^2)(e.P.Q) \text{ -----------------(V-4)}$$

Where:

t denotes $P_2 - P_1$ divided by P_2; this is the proportion of the increase in the price due to market power;

e denotes the absolute value of the price elasticity of demand; and

P.Q denotes the total value of shipments per period when market power is exerted.

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[11] F.M. Scherer, *op. cit.*, 402.

Referring to Figure V-1a, an increase in the price of a product from P_1 to P_2 and a reduction in output from Q_1 to Q_2 results in an increase in producer surplus denoted by P_1P_2BE minus EAG.[12] The area EAG is the deadweight social loss in producers' surplus. This area can be represented as:

$$dwl = (0.5)(P_1 - C)(Q_1 - Q_2) \text{ --------------(V-5)}$$

where the notations are the same as in Figure V-1a. The procedure of estimation of the deadweight loss in producer surplus involves estimating the price and output levels before market power is exerted.[13] Productive resources which are released when the level of output is reduced (denoted in Figures V-1a and V-1b by Q_1Q_2GA and Q_1Q_2EA, respectively, are assumed to be transferred to other sectors of the economy. If this is not the case, there are economic losses associated with underutilization of resources.

Some Empirical Studies Related to Economic Surplus Loss due to Market Power

A number of studies have attempted to assess losses in economic surplus due to the application of market power in the industrial and agricultural sectors. Some of these studies are reviewed in this section. The first attempt to assess losses in allocative efficiency due to substantial market power was by Harberger (1954).[14] Harberger estimated the deadweight loss in consumer surplus, shown as triangle ABE in both Figures V-1a and V-1b, in the manufacturing sector in the United States for the period of time from 1924 to 1928 using data for seventy three manufacturing industries. First, average profit rates on capital of this sample of industries over the period of time was taken as the competitive rate of return from which the average profit rates of each of the seventy three industries were compared. The differences between the average profit rate of the whole sample of industries and the average profit rate of each industry over the same period of time were taken as the estimate of excess profit rates. Using the available data on the value of capital from each industry, an estimate of the value of excess profits was calculated for the seventy three industries. These excess profits were expressed as a percentage of total sales of each industry and taken as a measure of price distortions due to substantial market power. Harberger then assumed a constant, rather than an increasing, long-run average cost curve for each industry. The elasticity of demand for the various products in each industry was taken as unity. The reduction in output during the period of time when market power was applied was estimated for each industry from demand and supply equations. The value of the deadweight loss in consumer surplus in each of the seventy three industries was calculated using a model of the form specified in Equations V-3 and V-4. The total value of the estimated losses for the seventy three manufacturing industries was adjusted to cover the whole of the manufacturing sector in the United States. The estimated deadweight loss in consumer surplus due to market power amounted to 0.1 percent of the gross national product of the United States over the period covered. Schwartzman (1960) used the same data and a similar procedure as Harberger to estimate the social costs of monopoly power in the manufacturing industries in the United States.[15] Monopoly price distortion was taken to be the difference between the price/cost ratios in concentrated Canadian industries and unconcentrated United States industries. Using a price elasticity of 2.0, this author estimated that the deadweight loss in consumer surplus did not exceed 0.06 percent of the gross national product of the United States.

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[12] In Figure V-1a, producers' surplus is denoted by the area below the price line P_1A and above the supply curve SA.

[13] Wallace (1962) has suggested an approximation approach to estimate the total deadweight loss in consumer and producer surplus denoted by triangle ABG in Figure V-1a. For a discussion of this model, see T.D. Wallace, "Measurement of Social Costs in Agricultural Programs," *Journal of Farm Economics* 44 (May 1962): 582.

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[14] Arnold C. Harberger, "Monopoly and Resource Allocation", *American Economic Review* (May 1954): 77-84.

Scherer (1970) discussed the various theoretical and empirical shortcomings of these procedures used in the estimation of social costs and outlined reasons why the previous studies might have underestimated this loss.[16] Scherer questioned the validity of the asumption that resources which were not used by monopolists who restricted output would be released to and used in other sectors of the economy. This author observed that unused resources in the form of excess capacity contributed to unproductive losses to the economy. Scherer also noted that, in general, the redistribution of incomes from consumers to producers had substantial adverse effects to consumers and the whole economy, though these effects were not taken into account by the general approach of the measurement of losses in economic surplus. Further, he noted that the assumption that long-run average costs are constant and are minimized was questionable. Leibenstein (1966) has argued that as a result of managerial slack or x-inefficiency, monopolists and oligopolists do not minimize costs.[17] Thus, the deadweight social loss in consumer surplus may be a small part of total losses in consumer surplus due to market power. The empirical problems arising from the use of this model to estimate losses in economic efficiency include the lack of accurate data on the long-run price elasticities of demand, profit rates and costs. Also, the lack of adequate data on costs associated with excess capacity, basing point pricing, government regulations and other factors tend to reduce the usefulness of this approach to the measurement of economic efficiency.

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[15] David Schwartzman, "The Burden of Monopoly", *Journal of Political Economy* (Dec. 1960): 627-30.

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[16] F.M. Scherer, *op. cit.*, 402-411.

[17] Harvey Leibenstein, *op. cit.*, (1966), 392-415.

Scherer (1970) estimated some indexes for the measurement of various components of losses in consumer surplus (including the transfer of incomes from consumers to producers, x-inefficiency and deadweight loss) attributable to substantial market power in the manufacturing sector in the United States in 1965.[18] On the basis of those indexes Scherer estimated the total social costs and income transfers related to market power in the industrial sector in the United States in 1965 to be 9.2 percent of the gross national product of that country.

Parker and Connor (1979) adjusted the indexes developed by Scherer and applied the same approach to the estimation of social costs of exertion of market power in the food manufacturing industry in the United States in 1975.[19] The components of social costs estimated by these authors are shown in Table V-1 above. The aggregate loss was estimated to be 7.3 percent of the total value of shipments of the food manufacturing industry. This amounted to about 12.5 billion dollars in 1975. The estimated loss was very close to other estimates of consumer losses due to exertion of market power made by these authors using two other different approaches. One of these alternative approaches of

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[18] F.M. Scherer, *op. cit.*,408.

[19] These authors used three approaches to estimate welfare losses. For more detail see Russell C. Parker and John M. Connor, "Estimates of Consumer Loss due to Monopoly Power in the United States Food-Manufacturing Industries," *American Journal of Agricultural Economics* 61 (Nov. 1979): 627-632.

TABLE V-1

The Loss-Components Estimates of the Total Consumer Losses Due to Market Power in the United States Food-Manufacturing Industries, 1975

Type of loss	Estimates of Losses As a percentage of the value of food shipments	millions dollars
(1) Income redistribution	2.1	3,613
(2) X-inefficiency due to excess advertising and promotion	2.3	4,000
(3) X-inefficiency due to		
(a) lack of cost control	1.7	2,890
(b) suboptimal scale	0.3	430
(c) cross-hauling	0.2	290
(d) excess capacity	0.5	870
(4) Deadweight loss	0.2	430
(5) Deadweight and X-inefficiency in regulated industries	0.0	0
(6) Total	7.3	12,523

SOURCE: Russell C. Parker and John M. Connor, "Estimates of Consumer Loss due to Monopoly Power in the United States Food-Manufacturing Industries," *AJAE* 61 (Nov. 1979): 631.

calculating losses in consumer surplus in different food industries in that country was based on regressions of structural and conduct features on profit rates.[20] The other approach was to estimate the extent of excess price enhancement using information on private and national brands. This involved calculating the extent by which prices of national brands exceeded the prices of private brands of similar quality. Each approach gave estimated losses which amounted to about $10 billion dollars for 1975. The closeness of the various estimates seems to suggest that, despite some difficulties with these approaches, they give useful estimates of the costs attributable to the exertion of substantial market power in an industry.

Three recent studies by Grubel and Schwindt (1977), Borcherding and Dorosh (1981) and Veeman (1981) have estimated social costs of supply management of certain marketing boards in Canada, using the framework of Figure V-1a.[21] In all these studies, the focus was on the estimation of deadweight social losses in consumer and producer surplus and of income transfered from consumers to producers. These authors inferred the value of excess prices due to the exertion of monopoly power of the respective marketing boards from the value of quota rights. Veeman also inferred the excess prices from differences between producer prices for poultry produced in the United States and Canada. The deadweight losses in consumer and producer surplus after marketing boards had been formed were estimated directly or from approximation formulae.

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[20] For a detailed discussion of this approach, see F.M. Scherer, *op. cit*. Also, see some of the studies cited in Chapter III of this study.

[21] Herbet G. Grubel and Richard W. Schwindt, *The Real Cost of B.C Milk Board: A Case Study in Canadian Agricultural Policy* (Vancouver: The Fraser Institute, 1977); Thomas Borcherding and Gary W. Dorosh, *The Egg Marketing Board: A Case Study of Monopoly and its Social Costs* (Vancouver: The Fraser Institute, 1981); and Michele M. Veeman, "Social Costs of Supply Restricting Marketing Boards," *Canadian Journal of Agricultural Economics* 30 (March 1982): 21-36.

The studies suggest that the short-run losses in allocative efficiency (deadweight loss) were small relative to the social costs of income transfers from consumers to producers. However, the most recent of these studies (Borcherding and Dorosh and Veeman) indicate that in the long-run, the losses in economic efficiency from cost increases in the industries are substantial. As was stated by Veeman (1981), the adverse effects of social costs are higher if account is taken of underutilization of capacity, losses of economies of specialization in production and trade, unexploited economies of scale, lags in adoption of improved tecnology, and the increased costs of production for new entrants arising from the capitalization of quota benefits into quota values or the value of land. These authors recognized that the estimates of social costs have to be viewed with caution mainly because of limitations in data, procedures of estimation and assumptions made about the characteristics of the demand and supply curves. It is evident from these studies that though the estimates are likely to have been conservative, they indicate the adverse economic impact of restricting output by marketing boards.

In summary, despite widely acknowledged limitations, the estimation of components of social costs appears to be a useful approach to the measurement of the losses in economic efficiency due to the exertion of market power. The order of the various estimates suggests a fairly high payoff for increased public policy attention to competitive problems in the economy.

VI. ALLOCATIVE EFFICIENCY IN THE SUGAR REFINING INDUSTRY IN CANADA

The analysis in the previous chapters suggests that the Canadian sugar refiners have exerted substantial market power in the pricing of refined sugar. This chapter provides an assessment of the economic effects of the exercise of market power by the refiners. The focus is on assessing effects of exertion of market power by the refiners on the level of allocative efficiency of the Canadian sugar refining industry.

Several approaches to the assessment of the level of allocative efficiency in the agriculture and food industries were presented in Chapter V, including the nature of price relationships and the estimation of losses in consumers' surplus due to exertion of market power. These approaches are now applied to the assessment of allocative efficiency in the Canadian sugar refining industry. A dimension of technical efficiency of the Canadian sugar refining industry has been considered in Chapter III under the topic of economies of scale. It was indicated there that the average total costs of refining sugar in the refineries in eastern Canada in 1963 seem to have been slightly higher than those of the most efficiently sized refineries. It is concluded that technical efficiency could possibly have been increased if refineries had been of the optimum sizes (with annual average output capacity of 30 to 50 thousand tons of refined sugar) in 1963. A further aspect of technical efficiency considered in this chapter is related to the utilization of plant capacities.

Two approaches to the assessment of allocative efficiency of the sugar refining industry are presented. The first involves an analysis of the relationships between prices of refined sugar at different stages of the marketing system and in spatially separated markets, using the competitive market model presented in Chapter V as a norm. This approach also involves an assessment of the level of profits in the Canadian sugar refining industry. The second appproach involves the estimation of social costs and income transfer effects which may be attributable to exercise of market power by Canadian refiners.

A. Relationships Between Sugar Prices in London, Montreal and New York

As indicated in Chapter V, the relationships between prices of a product at different levels of a marketing system, in spatially separated markets, and over different time periods can provide some indication of the extent of allocative efficiency in a market. Two different techniques of analysing price relationships are used to assess the level of allocative efficiency of the Canadian sugar refining industry. The first involves the calculation of correlation coefficients between prices of sugar in different markets. The second is a regression analysis of first differences of prices of sugar between different markets.

Two sets of data are used in this analysis. The first set consists of annual average prices for raw sugar on the London Sugar Terminal market and annual average wholesale and retail prices for refined sugar in Montreal from 1961 to 1978. The other data included in this set are annual average prices for raw sugar in New York landed at the port (cost, insurance, shipping and duty paid) and wholesale and retail prices for refined sugar in New York from 1961 to 1978. These data are shown in Appendix VI-1 and are from several published sources.[1]

The second set of data consists of monthly average wholesale prices for refined sugar in Montreal and the monthly averages for the United States for different periods of time between 1970 and 1977.[2] The monthly average wholesale prices per 100 pounds of granulated refined cane sugar for the United States are available continuously from 1970 to 1977.[3] However, wholesale prices for refined sugar in Montreal have been published only for four specific months (January, April, July and October) each year from

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[1] For the wholesale and retail prices for refined sugar in Montreal, see Canada, Statistics Canada, *op. cit.*, Cat. 32-222; *Idem*, Cat. 62-002 (various issues); for the annual prices of raw sugar on the London sugar market, see the International Sugar Organization, *Sugar Yearbook* (various issues 1960 to 1979); and for the prices of raw and refined sugar in New York, see United States Department of Agriculture, *Agricultural Statistics* (1966), 94 and (1979), 90.

[2] Canada, Statistics Canada, *op. cit.*, Cat. 32-222, (various issues); and United States Department of Labor, *Wholesale Prices and Indexes* (Washington D.C.: various issues 1972-1977).

[3] Unfortunately, more disaggregated data on monthly average wholesale prices for sugar in New York are not available.

1970 to 1975. Because these data are not continuously available for this period of time and are not available from 1976 to 1977, the missing monthly average wholesale prices in Montreal from 1970 to 1977 are estimated from monthly wholesale price indexes for refined sugar in Canada and from a base price for refined sugar in Montreal.[4] Thus, a continuous series of monthly average prices for granulated sugar in Montreal is estimated from 1970 to 1977. The prices of sugar expressed in American dollars are converted into Canadian dollars using the exchange rates published by the Bank of Canada.[5] Appendix VI-2 shows the monthly average prices of refined sugar in Montreal and the United States. All the prices are then deflated using the Canadian consumer price index for all items, taking 1971 as the base year.[6]

The prices of sugar in Montreal, London, New York and the United States are used in this analysis for a number of reasons. First, these markets are either major centers for cane sugar trade or refining. It is postulated that the price level of refined sugar in Canada (represented by

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[4] The average wholesale price index for the whole of Canada is used because price indexes by city and commodity are not available. The estimation procedure involves taking the price for refined sugar in Montreal in January 1971 as the base price. This is divided by the wholesale price index for refined sugar for Canada in January 1971. Finally, this is multiplied by the wholesale price index for refined sugar in Canada for the month considered. Data on wholesale price indexes for refined sugar in Canada are published by Canada, Statistics Canada, *Industry Selling Price Indexes by Major Groups*, Cat. 62-010 (Ottawa: Various issues 1974-1979).

[5] Canada, Bank of Canada, *Review* (various issues, 1972-1978); and *Idem*, *Statistical Summary Supplements* (1962).

[6] Canada, Statistics Canada, *Consumer and Price Indexes*, Cat. 62-011 (various issues, 1960 to 1979).

Montreal) is substantially influenced by the price levels of sugar on the London Sugar Terminal market and in the United States, particularly in New York which is a main center of trade in raw and refined sugar. Second, potential and actual imports of refined sugar into Canada are likely to originate from the United States. It is postulated that the pricing of refined sugar in Canada may be related to the level of prices for sugar in the United States.

Testing for Allocative Efficiency Using Correlation Coefficients

First, correlation coefficients between annual average prices of raw sugar in London, wholesale prices of refined sugar in Montreal and retail prices of refined sugar in Canada and wholesale and retail prices of refined sugar in New York for the period of time from 1961 to 1978 are presented. Second, correlation coefficients between monthly wholesale prices for refined sugar in Montreal and the United States are calculated for 1970 to 1973, 1974 to 1975 and 1976 to 1977 as well as for the entire period from 1970 to 1977. The time period from 1970 to 1973 relates to the time before Canadian customs duties on sugar were reduced. Also, during this period, imports of sugar products into the United States were strictly controlled through quotas by the Government of that country. Finally, sugar prices on the world market during this period were relatively low and stable. As discussed in Chapter III, the period of time from 1974 to 1975 corresponds to the period after the Canadian customs duties on imports of sugar products into Canada were substantially reduced. This also is the period when the trial court was hearing the *Atlantic Sugar* case. The time period from 1976 to 1977 relates to the period after the trial court acquitted Atlantic, Redpath and St. Lawrence. During this period, the Government of the United States did not control prices of refined sugar in that country through restrictive import quotas. It is noted that the distinction between these time periods may not be that strong. A correlation coefficient of 1 indicates perfect integration in price movements while zero indicates no relationship in the price movements between the markets considered.

Table VI-1 summarizes the correlation coefficients between the annual price series of raw sugar on the London Terminal market, refined sugar in Montreal and New York from 1961 to 1978. The correlation coefficients range from 0.85 to 0.99 and are statistically significant at the 1 percent level. The hypothesis that there is not a significant relationship between wholesale prices of refined sugar in spatially separated markets in Canada and the United States is rejected.

Table VI-2 summarizes the correlation coefficients between the monthly average wholesale prices of refined sugar in Montreal and the United States for different periods of time. The correlation coefficients between the monthly wholesale prices for refined sugar in Montreal and the United States for the different periods considered range

TABLE VI-1

Correlation Coefficients Between Annual Average Prices for Sugar in Montreal, London and New York From 1961 to 1978

	Raw Sugar		Refined Sugar			
			Wholesale		Retail	
Market	LDP	New York	Montreal	New York	Canada	New York
Raw sugar:						
LDP	1.00					
New York	0.97	1.00				
Refined sugar at Wholesale:						
Montreal	0.98	0.98	1.00			
New York	0.91	0.99	0.95	1.00		
Refined sugar at Retail:						
Canada	0.95	0.97	0.99	0.96	1.00	
New York	0.85	0.94	0.92	0.97	0.95	1.00

SOURCE: Calculated from data in Appendix VI-1.

NOTES: LDP denotes the London daily price for raw sugar free-on-board at Carribean ports.

TABLE VI-2

Correlation Coefficients Between and Variability in the Monthly Wholesale Prices for Refined Sugar in Montreal and the United States, 1970 to 1977

Period of time	Correlation coefficient	Mean price		Standard deviation		Coefficient of variation	
		Mo.	U.S.	Mo.	U.S.	Mo.	U.S.
		--dollars per 100 pounds-					
1970-77	0.929***	14.80	14.84	8.22	7.00	0.56	0.47
1970-73	-0.444***	10.56	11.80	1.43	0.34	0.13	0.03
1974-75	0.874***	25.30	23.14	9.55	9.92	0.38	0.43
1976-77	0.878***	12.00	12.00	2.14	1.67	0.18	0.14

SOURCE: Calculated from data in Appendix VI-2.

NOTES: *** shows that the coefficient is significant at the 99.0 percent level.
Mo. denotes Montreal; and
U.S. denotes the United States.

from -0.444 to 0.943. All the correlation coefficients are significant at the 1 percent level. The hypothesis that there is not a significant relationship between wholesale prices for refined sugar in the Canadian and United States' markets is rejected.

Even though all the correlation coefficients shown in Table VI-2 are significant, it is worthy of note that for 1970 to 1973, the correlation coefficient is negative and low. An explanation for this result is presented on pages 157 to 159. The interpretation of the correlation coefficients as a test of allocative efficiency of the sugar refining industry is also presented there.

The variability in the monthly wholesale prices for refined sugar in Montreal and the United States is also calculated for the different periods considered. The variability in prices is measured by the standard deviation and coefficient of variation around the mean. As shown in Table VI-2, the mean prices in Montreal are higher than those in the United States for the period of time from 1974 to 1975. The converse is true for 1970 to 1973. For each of the periods 1970 to 1977 and 1976 to 1977 the mean wholesale prices for refined sugar are the same in both countries. The standard deviations and coefficients of variation indicate that for the time periods from 1970 to 1973 and 1976 to 1977 as well as for the entire period of time from 1970 to 1977, monthly wholesale prices of refined sugar in Montreal were more variable than those in the United States. For the period of time from 1974 to 1975, the prices of sugar seem to have been less variable in Canada than in the United States. The interpretation of the results of the means, standard deviations and coefficients of variation is presented later in this chapter.

Testing for Allocative Efficiency Using First Differences of Prices of Sugar

A model of the form specified in Equation V-2 is used to test for allocative efficiency of the sugar refining industry. The dependent variable is the first difference of monthly wholesale prices for refined sugar in Montreal. The independent variable is the first difference of annual wholesale prices in New York or the monthly average wholesale prices for the United States. The first difference regression equations are analysed using the ordinary least squares method.[7]

First, the analysis uses annual average wholesale prices for refined sugar in Montreal and New York (from Appendix VI-1) for 1961 to 1978. The results are shown in Table VI-3 (model 1). Second, the analysis is repeated using the monthly wholesale prices for refined sugar in Montreal and the United States (from Appendix VI-2). The results for the different periods are shown in Table VI-3 (models 2 to 5).

The coefficients of determination (the R-square) for the different time periods considered range from 0.33 (for 1976 to 1977) to 0.79 (for 1961 to 1978). That is, changes in the monthly average prices in the United States explain 33 percent of the changes in the corresponding sugar prices in Montreal for 1976 to 1977. The changes in the annual wholesale prices for refined sugar in New York explain 79

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[7] Norman H.Nie, C. Halail Hull, Jean G. Jenkins, Karin Steinbrenner and Dale H. Bent, *op. cit.*

TABLE VI-3

First Difference Regressions Using Annual and Monthly Wholesale Prices for Refined Sugar in Canada and United States, 1961 to 1978

	Intercept	Estimated coefficient of independent variable	Coefficient of determination	F-value	D-W
(1)	-49.99	1.09*** NY (0.140)	0.79	60***	2.45+
(2)	-1.34	0.96*** US (0.052)	0.68	188***	2.22++
(3)	20.58	0.61*** US (0.084)	0.55	52***	1.54++
(4)	-13.92	1.02*** US (0.138)	0.71	54***	2.25++
(5)	-19.70	0.44*** US (0.140)	0.33	10***	2.27++

SOURCE: Calculated from data in Appendixes VI-1 and VI-2.

NOTES: The dependent variable is the first difference of prices in Montreal; and the independent variable is either the first difference of prices in New York (NY) or the United States (US)
Model (1) is based on annual prices for 1961 to 1978; Models (2) to (5) are based on monthly wholesale prices for the periods of time from 1970 to 1977, 1970 to 1973, 1974 to 1975, and 1976 to 1977, respectively.

Standard errors are shown in parentheses.
*** denotes significance at the 1 percent level.
+ denotes that the Durbin-Watson value is not conclusive. That is, there may or may not be autocorrelation in the data on sugar prices.
++ denotes that there is lack of autocorrelation in the data.

percent of the changes in the corresponding prices in Montreal for 1961 to 1978.

The estimated coefficients of the independent variables (annual wholesale prices of refined sugar in New York and monthly average wholesale prices of refined sugar for the United States) for the different periods considered range from 0.44 (for 1976 to 1977) to 1.09 (for 1961 to 1978). All the coefficients are positive and significant at the 1 percent level.

The coefficients of the independent variables suggest that changes in the annual and monthly wholesale price for refined sugar in the United States have been associated with significant changes in the corresponding prices for refined sugar in Montreal for the different periods between 1961 and 1978, though it is probable that this is not a cause and effect relationship. The hypothesis that there is not a significant relationship between wholesale prices of refined sugar in Canada and the United States is rejected.

Interpretation of the Results

As noted earlier, the correlation coefficient between monthly wholesale prices in Montreal and the monthly averages of the United States for 1970 to 1973 is low and negative, though significant. The result implies that the nature of the association between prices of refined sugar in the two countries was opposite and weaker than in the other periods of time considered. Two reasons seem to explain these differences in the association between prices of refined sugar in the two countries. First, between 1970 and 1973 the Government of the United States maintained prices for refined sugar at a substantially higher level than that in Canada. The higher level of prices was effected through strict import quotas on raw and refined sugar into that country. The restriction of imports likely limited the potential price competition between Canadian and United States' sugar refiners. The standard deviations about the means of prices of refined sugar for the United States (Table VI-2) indicate that prices were more stable for 1970 to 1973 than for the other periods. The stable prices for 1970 to 1973 are likely to have been due to the restriction of imports of sugar into the United States through quotas. At the end of 1974, the restriction of imports of sugar into the United States was relaxed and the association between prices for refined sugar in the two countries is positive and seems to be stronger than for 1970 to 1973. Second, before February 1973, the levels of Canadian customs duties on imports of sugar were higher than later. As discussed in Chapter III, in February 1973 the level of the Canadian customs duties was substantially reduced. The higher level of tariff protection before 1973 likely limited price competition between Canadian and United States' sugar refiners.

The strong relationship between prices of refined sugar (annual and monthly) in Canada and the United States (except for 1970 to 1973) could be attributed to two features of pricing behavior of sugar refiners in Canada. One feature may be that sugar products in Canada (represented by Montreal) have been priced relative to those in the United States. The likely objective of such pricing strategy could be to deter imports of refined sugar from the United States. Another likely reason is that changes in the annual and monthly average prices for refined sugar in both countries have occurred in response to changes in prices of raw sugar on the world market.

For a perfectly competitive market the high correlation between the prices for refined sugar in Montreal and in the United States would suggest a high degree of allocative efficiency in the Canadian sugar refining industry between 1961 to 1978 (except for 1970 to 1973). However, for the highly oligopolistic Canadian refining industry, such a conclusion is highly doubtful. As will be shown later in this chapter, there is evidence which suggests that the level of allocative efficiency in this industry was low over this time period. Thus, the results from the above analyses appear to be more indicative of co-ordinated pricing of refined sugar by the Canadian refiners.

B. Relationships Between Retail Prices for Refined Sugar in Different Markets in Canada

Another test of allocative efficiency in the sugar refining industry can be performed using data on wholesale prices of refined sugar in different markets in Canada. However, wholesale prices of refined sugar in different Canadian cities are not readily available. For this reason, an assessment of allocative efficiency in the refining industry is undertaken using retail prices of refined sugar in fourteen major cities in Canada. These data are shown in Appendix VI-3.

The Food Prices Review Board (1974) published monthly average retail prices for refined sugar in fourteen cities from January 1973 to April 1974. Since 1975, Statistics Canada has published retail prices for refined sugar in fourteen cities for the third week of April and October of each year.[*] In the absence of other data, these are taken to represent the monthly average retail prices of refined sugar for the different cities considered for the period of time from 1973 to 1980.

It is expected that the relationships between the movements in monthly average wholesale prices for refined sugar in the different markets can be inferred from the movements in monthly average retail prices in the different markets considered. To infer that movements and distortions in the relationships of sugar prices at the retail level are attributable to the sugar refining industry implies a number of assumptions. First, it is assumed that the retail market for refined sugar is competitive in each of the cities considered. Implicitly associated with this is the assumption that retail price margins for refined sugar in each city are similar and reflect only normal profit margins. Similar assumptions were made by Hassler (1953) in the analysis of pricing efficiency in the dairy products manufacturing sector in the United States.[9] However, given the variability in the regional concentration levels in the retail grocery industry, the analysis outlined below must be viewed with some caution.

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[*] Food Prices Review Board, *op. cit.*, (1974), 53; and Canada, Statistics Canada, *op. cit.*, Cat. 62-010 (various issues 1975 to 1981).

The two approaches described in the previous section are used in the analysis of price relationships. The first approach involves the calculation of correlation coefficients between the retail price series for refined sugar in different pairs of cities. The monthly wholesale prices of refined sugar in Montreal, presented in Appendix VI-2, are also included in this analysis. The second approach again involves a regression model in which the first differences of monthly wholesale prices of refined sugar in Montreal are taken as the independent variable. Montreal is the main center for refining sugar in Canada and is, in effect, treated as a proxy for the national market. The dependent variable is the first difference of monthly retail prices of refined sugar in either Toronto, St. John,

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[9] J.B. Hassler, *op. cit.*, 260.

Winnipeg, Edmonton or Vancouver. These cities represent different regions in Canada and also are major sugar refining or consuming centres. The regression model used is of the form specified in Equation V-2. The price series are deflated using the Canadian consumer price index for all items, taking 1971 as the base year.

Table VI-4 summarizes the correlation coefficients between prices of refined sugar in the different cities. All the correlation coefficients are high, ranging from 0.86 to 1.00 and are significant at the 1 percent level. The hypothesis that there is not a significant relationship between wholesale prices of refined sugar in spatially separated markets in Canada is rejected. The high correlation coefficients between prices of refined sugar in different markets would, in a competitive market, suggest that the level of allocative efficiency is high in the refining industry. Such a test is, however, weak and conclusions of high levels of pricing efficiency are not warranted. The interpretation of the correlation coefficients as a test of allocative efficiency is presented at the end of the next section.

Table VI-5 summarizes the results of the regressions of the first differences of monthly wholesale prices for refined sugar in Montreal as the independent variable and the monthly retail prices for refined sugar in the five different cities as the dependent variables. The coefficients of determination range from 0.58 (for

TABLE VI-4

Correlation Coefficients Between Monthly Retail Prices of Refined Sugar in Fourteen Major Cities in Canada, 1973 to 1980

	St. Johns	Halifax	St. John	Quebec City	Montreal (Wholesale)	Montreal (retail)	Ottawa	Toronto	Thunder Bay	Winnipeg
St. Johns	1.00									
Halifax	0.96	1.00								
St. John	0.97	0.99	1.00							
Quebec	0.98	0.98	0.98	1.00						
Montreal (wholesale)	0.94	0.89	0.93	0.94	1.00					
Montreal (retail)	0.98	0.98	0.99	1.00	0.94	1.00				
Ottawa	0.98	0.98	0.99	1.00	0.93	1.00	1.00			
Toronto	0.96	0.97	0.99	0.98	0.92	0.99	0.99	1.00		
Thunder Bay	0.97	0.95	0.95	0.98		0.98	0.98	0.96	1.00	
Winnipeg	0.97	0.97	0.98	0.98	0.92	0.98	0.99	0.97	0.98	1.00
Saskatoon	0.94	0.96	0.97	0.95	0.86	0.95	0.96	0.95	0.93	0.97
Regina	0.95	0.98	0.98	0.97	0.89	0.97	0.97	0.96	0.95	0.98
Edmonton	0.96	0.98	0.97	0.97	0.89	0.97	0.97	0.96	0.97	0.99
Calgary	0.97	0.98	0.99	0.98	0.90	0.99	0.99	0.98	0.97	0.98
Vancouver	0.95	0.96	0.96	0.96	0.88	0.97	0.98	0.96	0.96	0.96

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TABLE VI-4
CONTINUED

	Saskatoon	Regina	Edmonton	Calgary	Vancouver
St. Johns					
Halifax					
St. John					
Quebec					
Montreal (wholesale)					
Montreal (retail)					
Ottawa					
Toronto					
Thunder Bay					
Winnipeg					
Saskatoon	1.00				
Regina	0.99	1.00			
Edmonton	0.98	0.99	1.00		
Calgary	0.98	0.99	0.99	1.00	
Vancouver	0.97	0.97	0.97	0.99	1.00

SOURCE: Calculated from data shown in Appendix 6-3

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TABLE VI-5

Results of Regressions of First Differences of Monthly Prices of Refined Sugar in Different Markets in Canada From 1973 to 1980

Equation (Dependent variable)	Estimate of Intercept	Estimated coefficient of independent variable (Montreal)	Coefficient of determination (R-square)	F-value	D-W
VI-7 (Toronto price)	30.42	1.00*** (0.148)	0.67	45***	3.09+
6-8 (Winnipeg price)	16.42	0.92*** (0.110)	0.76	76***	2.05++
6-9 (St. John price)	27.57	1.05*** (0.110)	0.80	90***	2.49++
6-10 (Edmonton price)	25.24	0.97*** (0.123)	0.74	63***	1.71++
6-11 (Vancouver price)	41.83	0.86*** (0.156)	0.58	30***	2.78+

SOURCE: Calculated from data in Appendix VI-3.

NOTES: D-W denotes the Durbin-Watson statistic.
The standard error of the slope coefficients are given in parentheses.
*** denotes that the estimated value is significant at the 99.0 percent level.
+ denotes autocorrelation may be present in the data.
++ denotes lack of autocorrelation in the data.

Vancouver) to 0.80 (for St. John). The coefficients of determination suggest that changes in the monthly wholesale prices of refined sugar in Montreal explain a large proportion of the changes in the monthly retail prices of refined sugar in Toronto, St. John, Winnipeg, Edmonton and

Vancouver, respectively. The low coefficient of determination between the monthly wholesale prices of refined sugar in Montreal and retail prices of refined sugar in Vancouver indicates that retail prices in that city are more insulated from the influence of prices in Montreal than are retail prices in the other cities.

The estimated coefficients of the independent variable range from 0.86 (for Vancouver) to 1.05 (for St. John). All the coefficients are positive and significant at the 1 percent level. The hypothesis that there is not a significant relationship between wholesale prices of refined sugar in spatially separated markets in Canada is rejected. The estimated coefficients of the independent variable suggest that changes in the monthly wholesale prices of refined sugar in Montreal are reflected fully in the retail prices of refined sugar in Toronto and St. John and less than fully in the prices of refined sugar in Winnipeg, Edmonton and Vancouver, though these differences are not statistically significant.

As noted earlier in this chapter, in a perfectly competitive market a high correlation between prices for refined sugar in different markets in Canada would suggest a high level of allocative efficiency. This does not seem to be the case for the Canadian sugar refining industry for 1973 to 1980. The strong relationship between prices of refined sugar is most probably due to the system of delivered pricing using Montreal as the major base point.

The high level of correlation reflects market integration which is not necessarily indicative of a high level of allocative efficiency. Also, as the analysis in the next section shows, geographical price spreads between some of the markets considered here do not appear to be fully warranted by differences in transportation costs. Also, as discussed in the next section of this study, the profit levels of Canadian refiners have been high compared to those of cane sugar refiners in the United States and are indicative of a low level of allocative efficiency in the refining industry from 1961 to 1978. It can be concluded that the strong relationship between prices of refined sugar in the different markets in Canada at the wholesale level (estimated from retail prices of sugar) does not appear to be an indication of high levels of allocative efficiency. This feature is most likely due to the formula and delivered pricing of refined sugar by Canadian refiners.

Retail Price Levels and Price Differentials for Refined Sugar in Different Markets in Canada

In this section, the levels of retail prices in different markets and geographical price spreads between different markets for 1973 to 1980 are evaluated using graphical illustrations. Again, the monthly retail price data shown in Appendix VI-3 are used in this analysis.

Table VI-6 shows the means and standard deviations about the means of the series of sugar prices for fourteen different cities in Canada. In general, monthly retail

TABLE VI-6

Means and Standard Deviations of Monthly Prices of Refined Sugar in Different Markets in Canada, 1973 to 1980 (expressed in 1980 dollars)

Market	Mean price	Standard deviation
	cents per pound	
St. Johns (N.F.)	39.05	13.35
Halifax	34.33	12.66
St. John	36.56	13.48
Quebec City	35.51	12.40
Montreal (retail)	35.21	12.24
Ottawa	34.64	11.71
Toronto	35.13	13.92
Thunder Bay	38.12	10.70
Winnipeg	37.34	10.74
Regina	39.99	12.49
Saskatoon	40.52	13.37
Edmonton	38.29	11.86
Calgary	37.91	11.71
Vancover	37.00	12.89
Montreal (wholesale)	30.75	11.67

SOURCE: Calculated from data in Appendix VI-3.

prices for refined sugar in the respective cities in western Canada have been higher than in most of the different cities in eastern Canada for the period of time from 1973 to 1980. The average prices in western and eastern Canada were, in 1980 prices, 38.52 and 36.08 cents per pound of refined sugar, respectively.

Figure VI-1 shows the movements in retail prices for refined sugar in Ottawa and Saskatoon between 1973 and 1980. These two cities tended to have the lowest and highest retail prices of refined sugar in Canada, respectively, over this period.

Figure VI-2 shows the geographic price spreads between Montreal and Ottawa and between Montreal and Saskatoon.[18] Prices of refined sugar in these two pairs of cities are chosen since the geographic price spread between Ottawa and Montreal and between Saskatoon and Montreal have been the lowest and highest, respectively. The Ottawa minus Montreal price differences are small and negative for most of the time from 1973 to 1980 since retail prices of refined sugar in Ottawa are marginally lower than those in Montreal. The Saskatoon minus Montreal price differences during this period of time are large since retail prices in Saskatoon are considerably higher than those in Montreal.

From the geographical price spreads there are some indications that there may have been "unwarranted" price

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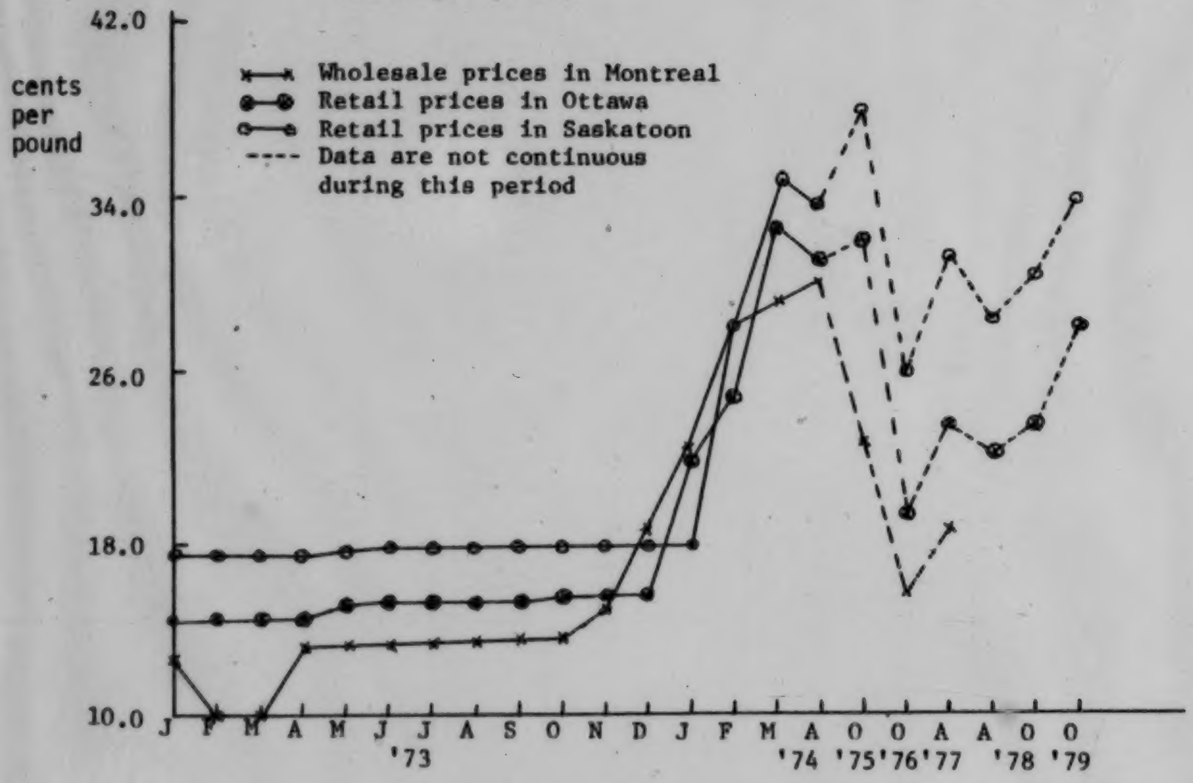
[18] The geographic price spread is defined as the retail price of refined sugar in one market minus the retail price of refined sugar in Montreal.

FIGURE VI-1

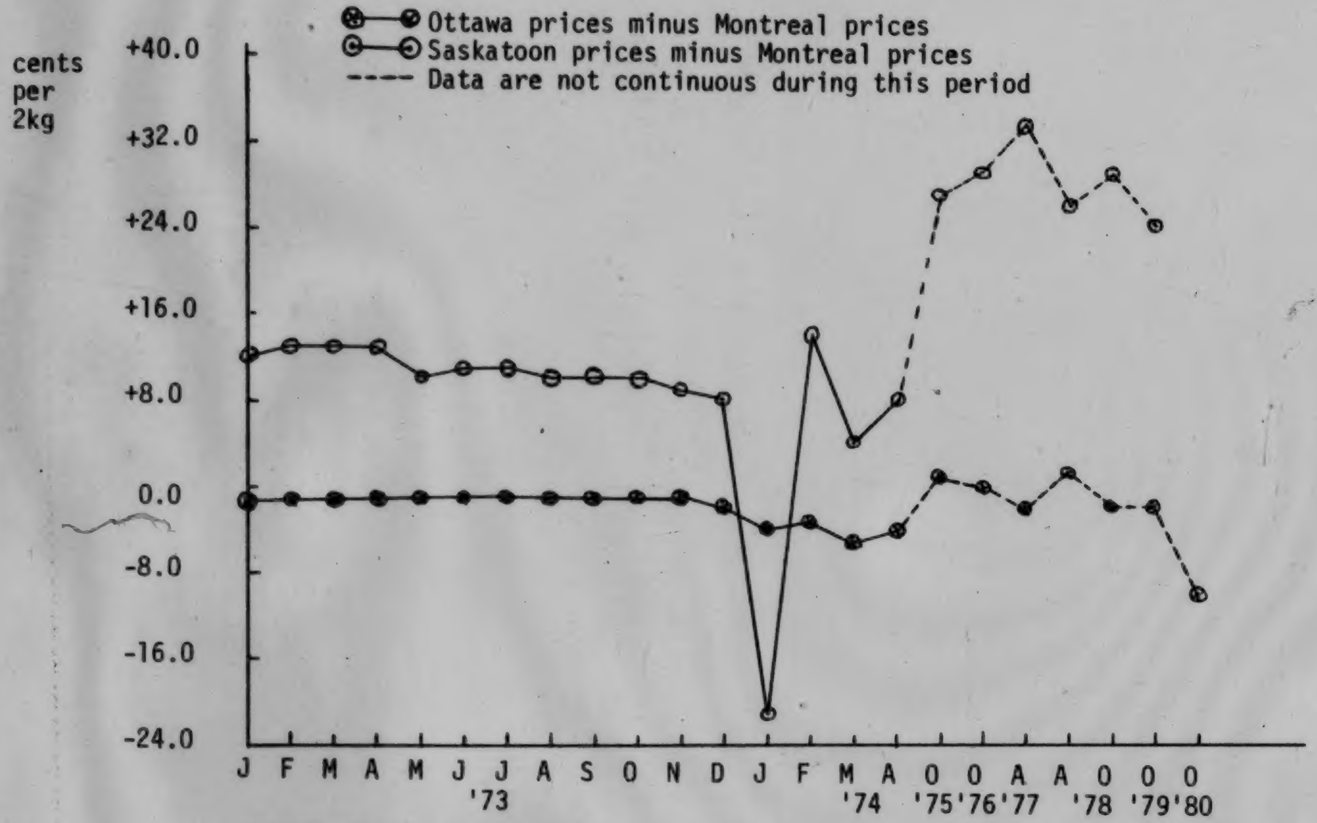
Monthly Prices of Refined Sugar in Montreal, Ottawa and Saskatoon, 1973 to 1979
(cents per pound)



SOURCE: Derived from data in Appendix VI-2

FIGURE VI-2

Monthly Price Differences for 2 Kilograms of Refined Sugar Between Ottawa and Montreal and Between Saskatoon and Montreal, 1973 to 1980 (cents)



SOURCE: Derived from data in Appendix VI-2 patterns in the different markets considered. The warranted price pattern is defined in terms of the perfectly competitive norm. That is, prices of refined sugar in different markets should not differ by more than the cost of transportation. One example of an unwarranted price pattern during this period (1973 to 1980) is that prices of refined sugar have been lowest in Ottawa and Halifax rather than in cities in which sugar refining plants are located.[11] Another example of an apparently unwarranted retail price pattern is the feature that the highest levels of sugar prices have been in Edmonton and Saskatoon, though these cities are located close to their main sources of refined sugar which are, respectively, Taber, Alberta and Fort Garry, Manitoba.

The apparently unwarranted price patterns during 1973 to 1980 could be explained by a number of reasons. First, the feature that the lowest level of sugar prices occurred in Ottawa could be attributable to price competition among refiners located in Montreal, Toronto, St. John and Oshawa and the lack of competition in the latter group of cities and in western Canada. The lowest prices of refined sugar in Halifax might be explained by the practice of limit pricing in that city by Canadian refiners in order to deter imports of refined sugar into Halifax.

Second, as Mallen (1976) showed, the level of market concentration in the Canadian retail food trade in 1973 was much higher in western Canada and Ontario than in Quebec and the Maritime provinces.[12] Thus, the apparent unwarranted retail price patterns could be attributable to exertion of market power by local food retailers. Third, the relatively high price levels for refined sugar in Edmonton and Saskatoon (and in other cities in western Canada) could be due to higher costs of processing beet sugar than those for refining raw cane sugar.

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[11] As reported in Table 2-1, sugar refineries are located in St. John, Montreal, Oshawa, Fort Garry (Winnipeg), Taber and Vancouver.

Though the apparently unwarranted prices at the retail level can be explained by factors operating at that level of the market, a number of reasons suggest that much of the price distortion discussed earlier is attributable to sugar refiners. First, the sugar refining industry is more concentrated than the retail food sector at the national and regional levels. It follows that price competition is likely to be much less at the level of the refiner than the retailer. Second, as discussed in the next section, the relatively high levels of profit rates in the Canadian sugar refining industry (Table VI-6 and VI-7) are evidence of low levels of allocative efficiency. It seems probable that much of the price distortion discussed earlier could be attributable to excess price markups at the refining level. Even then, this result has to be accepted with reservation. Further research using data on wholesale prices would be needed to determine sources of the apparent price distortions at the retail level.

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[12] Bruce Mallen, "The Levels, Causes and Effects of Economic Concentration in the Canadian Retail Food Trade: A Study of Supermarket Market Power" A paper commissioned by the Food Prices Review Board, Reference No. 6, February 1976, 65-67.

C. The Level of Profits in the Sugar Refining Industry in Canada

Economic theory suggests that the existence of above normal profits earned in an industry may be associated with substantial barriers to entry and market power in that industry. It may also suggest that relatively low levels of allocative efficiency apply in such an industry. Though high levels of profits over a long period of time may imply exertion of market power, and consequently loss of allocative efficiency, the converse does not necessarily apply. That is, the absence of relatively high levels of profit rates in relatively concentrated industries can be associated with higher costs of production and marketing (x-inefficiency) and low levels of scale efficiency. In this section, an assessment of the level of profit rates is presented. The objective is to aid in ascertaining whether the sugar refining industry in Canada has operated with a high or low level of allocative efficiency from 1960 to 1978.

The approach taken in the assessment is to compare available information on profits (profits expressed as a percentage of equity and price-cost margins expressed as a percentage of the price of refined sugar) in the Canadian refining industry with that in the cane sugar refining industry in the United States for the period of time from 1961 to 1978. This analysis builds on two previous studies, one by the Tariff Board in 1971 and another by the Food Prices Review Board in 1975.

In 1971 the Tariff Board assessed the average total costs and profit margins per 100 pounds of refined sugar for the different Canadian sugar refiners and refining plants from 1966 to 1968.[13] The Tariff Board concluded that there was considerable disparity in the levels of annual average costs and profit margins from one refiner to another. The Food Prices Review Board (1975) reported some annual average rates of return on capital in the sugar refining industry, canning and preserving, dairy products, grain and cereals and bakery industries in Canada for 1967 to 1972.[14] The average rates of return on capital in each of the canning and preserving, dairy products, grain and cereal products, and bakery industries were considerably lower than the average for the sugar refining industry from 1967 to 1972. Over this period the average rate of return on capital for all food processing industries, excluding the sugar refining industry, was 15.7 percent compared with 29.5 percent in the refining industry. The high level of profits in the sugar refining industry relative to those earned in the other food processing industries considered by the Board strongly suggests that above normal profits were being earned in this industry. This also suggests that barriers to entry were effective over this time period. Thus, relatively low levels of allocative efficiency appear to have applied in the sugar refining industry.

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[13] For a detailed exposition, see the Tariff Board, *op. cit.*, 32-33.
[14] The Food Prices Review Board, *op. cit.*, (1974), 19-23.

Three different measures of profits are computed for the sugar refining industry in Canada and cane sugar refining industry in the United States for different time periods from 1960 to 1978. The first measure is profits (after taxes) expressed as a percentage of equity for the three largest Canadian refiners (Atlantic, B.C. Sugar and Redpath) and for the twelve largest cane sugar refiners in the United States for 1961 to 1971. This is the period for which data on annual average rates of return on equity for the twelve refiners are reported by Bohall (1977). Data on profits and the value of equity of the three Canadian refiners are published by the Financial Post Services and the respective refiners.[15] The second comparison is return (after taxes) on equity for the three largest refiners in Canada and Amstar Corporation of the United States for 1965 to 1978.[16] The third profit measure is given by price-cost margins expressed as a percentage of the annual value of shipments of the sugar refining industry in Canada and the cane sugar refining industry in the United States for 1960 to 1977. The price-cost margin is the difference between gross revenues and direct costs expressed as a percentage of the annual total value of shipments. If data are limited, this measure can also be approximated as follows: The difference between the annual value-added and payroll expenditure is calculated and the dollar value of this difference is divided by the annual value of shipments of the industry to give the percentage price-cost margin. This percentage is taken as a proxy measure for the difference between average price and costs expressed as a percentage of the price of refined sugar.[17]

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[15] Annual Reports of Redpath; Annual Reports of Atlantic Sugar Refineries; Annual Reports of B.C. Sugar Refinery; The Financial Post Corporation Services, *Redpath Industries; Atlantic Sugar Refineries; B.C. Sugar Refinery*, (various issues); and Robert Bohall and others, *op. cit.*, (1977), 18.

[16] Amstar Corporation is one of the largest cane sugar refiners in the United States. It is the only refiner in the United States for which Moody's Investors Service has published continuous and most recent data on annual profits. See Moody's Investors Service, *Moody's Industrial Manual, American and Foreign* (New York: various issues).

The annual total value-added, payroll expenditures and value of shipments of the sugar refining industry in Canada are published by Statistics Canada (Catalogue 32-222). Corresponding data for the cane sugar refining industry in the United States are published by the Department of Commerce in that country.[18] For the purpose of this study, it is assumed that differences in rates of return of the two industries are attributable to differences in profits earned by the refiners rather than to differences in the methods of compiling the data.

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[17] The inclusion of costs such as insurance, rental payments, advertising, property taxes and depreciation in the price-cost margins can be argued for. This measure is justified on the grounds that these costs may be a small part of the total costs in the refining of sugar. It is also assumed that these costs are similar for the sugar refining industries in Canada and the United States. For a more detailed discussion of this approach to measuring profits, see N.R. Collins and L.E. Preston, *op. cit.*, 54-56.

[18] Canada, Statistics Canada, *op. cit.*, Cat. 32-222 (1971, 1973 and 1978); and the U.S. Dept. of Commerce, *1977 Census of Manufactures: Industry Series Sugar and Confectionery Products* (Washington D.C: U.S. Govt. Printing Office, 1980).

It is worthy of note that, as was shown in Chapter III, the cane sugar refining industry in the United States has been less concentrated than most food processing industries in that country between 1960 and 1971. It was also reported in Chapter III that the level of concentration in the cane sugar refining industry in the United States has been substantially less than in the sugar refining industry in Canada. Unlike the situation in the Canadian sugar refining industry, it has been reported that the annual average rate of return on equity in the cane sugar refining industry in the United States was lower than in most food processing industries in that country for 1961 to 1971 (Bohall, p. 18). Bohall also reported that for 1961 to 1971, the annual average rate of return in that industry in the United States ranked in the lower 50 percent of all industries reported by the Federal Trade Commission. Thus, the cane sugar refining industry in the United States appears to have been workably competitive compared to the situation in the Canadian refining industry for the time period from 1961 to 1978. It appears also that profits in that industry have been consistent with the assumption that relatively high levels of allocative efficiency have applied.

Table VI-7 shows the reported annual average profits (after taxes), expressed as a percentage of equity, of the three largest sugar refiners in Canada, the twelve largest cane sugar refiners in the United States and Amstar Corporation for different periods of time between 1961 and 1978. The annual rates of return on equity of B.C Sugar are the highest of the three Canadian refiners for most of the years considered. These high rates of return could be attributable to the monopoly power of B.C. Sugar in western Canada and is likely indicative of lower levels of allocative efficiency in this region.

For the period of time from 1961 to 1971 the rates of return on equity of the three largest Canadian refiners are higher than those of the twelve largest cane sugar refiners in the United States for 1961 to 1971. For the period of time from 1965 to 1978 the average rates of return on equity of the three Canadian refiners are higher than those of Amstar Corporation, except in 1976. Over this period (1965 to 1978) the rate of return on equity of the three Canadian refiners averaged 15.2 percent compared to 6.2 of Amstar Corporation.

Table VI-8 shows the annual price-cost margins expressed as percentages of prices of refined sugar in Canada and the United States for 1960 to 1977. For each of the years from 1960 to 1973 the percentage price-cost margins in Canada are substantially greater than those of the cane sugar refining industry in the United States over the same period. However, the percentage price-cost margins of the refining industry in Canada are lower than are those

TABLE VI-7

Percentage Return (after Taxes) on Equity of Sugar Refiners in Canada and the United States, 1961 to 1978

	Rates of Return on equity of refiners					
Year	Redpath (1)	Atlantic (1)	B.C. (1)	Average of largest three* refiners in Canada (1)	Average of largest twelve refiners in U.S. (2)	Amstar (3)
			percentages			
1961	9.3	10.0	8.3	9.2	7.2	
1962	9.6	13.1	11.9	11.5	8.1	
1963	7.5	14.4	18.3	13.4	10.3	
1964	9.3	14.4	24.9	16.2	8.3	
1965	8.9	19.2	16.0	14.7	9.2	5.6
1966	8.4	19.5	15.1	14.3	10.0	5.2
1967	8.7	13.4	21.4	14.6	9.8	4.5
1968	10.8	4.0	19.4	11.4	8.2	4.8
1969	11.1	16.9	21.4	16.5	3.3	1.3
1970	10.9	11.3	16.4	12.9	8.2	4.8
1971	9.0	14.2	19.8	14.3	9.6	6.3
1972	8.8	11.0	21.3	13.7		5.2
1973	10.1		24.6	17.4		4.3
1974	10.4		30.6	20.5		6.5
1975	12.2		27.7	20.0		8.8
1976	11.7		15.6	13.7		16.1
1977	12.2		19.9	16.1		9.9
1978	6.7		19.3	13.0		4.9

SOURCE: Calculated from financial statements published by: (1) Financial Post Corporation Services, *Atlantic Sugar Refineries*, *Redpath Industries* and *B.C. Sugar Refinery*. (2)The data for the American refiners are from Robert Bohall and others, *op. cit.*, (1977), 18;(3) and Moody's Investors Service, *Moody's Industrial Manual, American and Foreign* (New York: various issues).

NOTES: * The last year for which profits of Atlantic are available is 1972. After this date, the company's profits are consolidated with the financial statements of Jannock Corporation.

TABLE VI-8

Percentage Price-Cost Margins of the Sugar Refining Industries in Canada and the United States, 1960 to 1977

	Price-cost margins as a percent of price of refine sugar		
Year	Canada	U.S.A.*	Difference (Canada minus U.S.A.)
	percentages		
1960	23.1	12.4	10.7
1961	19.8	11.4	7.4
1962	24.2	12.7	12.5
1963	18.8	12.9	5.9
1964	17.8	9.9	7.9
1965	22.7	15.5	7.2
1966	23.1	14.3	8.9
1967	26.1	15.7	10.4
1968	25.8	14.1	11.7
1969	25.7	15.2	10.5
1970	23.4	17.9	5.5
1971	19.3	15.6	3.7
1972	17.5	15.2	2.3
1973	15.9	15.4	0.5
1974	6.3	16.9	-10.6
1975	9.9	9.6	0.3
1976	8.6	15.1	-6.5
1977	15.0	15.8	-0.8
Average	19.1	14.2	4.9

SOURCE: Calculated from data published by Canada, Statistics Canada, *Cane and Beet Sugar Processors* Cat. 32-222; and U.S. Dept. of Commerce, *1977 Census of Manufactures: Industry Series Sugar and Confectionery Products* (Washington D.C.: U.S. Govt. Printing Office, 1980).

NOTE: * These percentage price-cost margins apply to the cane sugar refining industry in the United States.

of the cane sugar refining industry in the United States for 1974, 1976 and 1977 and about equal for 1975.

The hypothesis that average profit rates in the Canadian sugar refining industry have been statistically significantly higher than average profit rates in the cane sugar refining industry in the United States for the period of time from 1960 to 1978 is tested using the one-tail t test.'' Three values of t are computed using three different measures of profit rates. The computed value of t statistic using data on rates of return on equity of the three largest Canadian refiners and twelve United States' cane sugar refiners is 7.33 and is greater than the critical value of the one-tail t of 2.76 at the 1 percent level of significance. The computed value of t statistic using data on rates of return on equity of the three largest Canadian refiners and Amstar Corporation is 12.15 and is greater than the critical value of the one-tail t of 2.65 at the 1 percent level of significance. The computed value of t using data on percentage price-cost margins of the Canadian sugar refining industry and the cane sugar refining industry in the United States is 3.30 and is greater than the critical value of the one-tail t test of 2.57 at the 1 percent level

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'' The one-tailed t statistic is used to test whether one mean of a sample is significantly greater or less than the mean of another sample or population. That is, the null hypothesis stipulates the direction of one mean compared to another (Mason, 285). For the procedure of calculating the value of one-tail t see Norman H.Nie, C. Halail Hull, Jean G. Jenkins, Karin Steinbrenner and Dale H. Bent, *op. cit.*, 271-275.

of significance. Since the computed values of t are greater than the critical values of the one-tail t, the hypothesis that profit rates in the Canadian sugar refining industry have been significantly higher than in the cane sugar refining industry in the United States for the period of time from 1960 to 1978 is accepted.

In summary, the assessment of rates of return of the Canadian sugar refining industry strongly suggests that above normal profits were earned by Canadian sugar refiners in comparison to United States cane sugar refiners from 1960 to 1973. The higher rates of return are indicative of relatively low levels of allocative efficiency. A comparison of percentage price-cost margins in the Canadian and United States refining industry suggests that Canadian refiners did not earn above normal profits from 1974 to 1978. However, this is not confirmed by a comparison of rates of return on equity of Canadian and United States refiners which indicates that above normal profits were earned during this period. Thus, a definitive conclusion cannot be reached on whether the level of allocative efficiency increased from 1974 to 1978.

The lower rates of profit from 1974 onwards likely have been due to three reasons discussed earlier in this chapter. First, the restriction of imports of raw and refined sugar into the United States has been relaxed since 1974. It is possible price competition between Canadian and United States refiners increased. The second possible reason is that, as noted in Chapter III, from 1973 onwards customs duties on imports of sugar into Canada were substantially reduced. It seems probable that competition from imports of refined sugar was more evident than before. Third, between 1974 and 1980 the *Atlantic Sugar* case was successively heard by a trial court, a court of appeal and the Supreme Court of Canada. These factors may have had an impact on the pricing policies of the Canadian refiners which in turn may have had a downward effect on their profits.

Correlation coefficients between two sets of data on rates of return (presented in Tables VI-7 and VI-8) of the Canadian sugar refining industry and the effective rates of protection afforded this industry (presented in Table III-7) are calculated for 1961 to 1978. The objective is to determine whether there is any indication that the high levels of profit rates have been associated with the high levels of the effective rates of protection. In the first case, correlation coefficients between the effective rates of protection and the annual rates of return on equity of each of Atlantic, B.C. Sugar and Redpath are calculated. All the estimated correlation coefficients are less than 0.10. These coefficients are negative and are not significant at the 10 percent level. When the annual average rates of return on equity of the three refiners are used in the calculation the correlation coefficient is -0.14 and is not significant at the 10 percent level. Second, the calculation is repeated using the percentage price-cost margins (Table

VI-8) of the Canadian refining industry. The correlation coefficient is -0.56 and significant at the 10 percent level. It is worthy of notice that both effective rates of protection and price-cost margins are calculated from data on value-added and shipments of the industry. The significant relationship between these variables is most probably spurious.

Wilkinson and Norrie (p. 61-62) did not find a strong relationship between rates of return to capital and effective rates of protection for the manufacturing industries in Canada. The authors explained that since the protective structure had been in force for many years industrialists had adjusted to it. It was explained that the disparities in rates of return between Canadian industries were likely associated with such factors as industrial concentration, geographic separation of domestic markets and government regulations. The low correlation between the two sets of rates of return and the effective rates of protection in the refining industry most probably could be explained by similar factors.

The results of the test of the hypothesis that there is a significant relationship between the effective rates of tariff protection afforded the Canadian sugar refining industry and profit rates of this industry are inconclusive.

D. Social Costs and Income Transfer Effects of Market Power of Sugar Refiners in Canada

The use of the concept of economic surplus in the assessment of allocative efficiency and other economic distortions resulting from the application of market power is outlined in Chapter V. In this section, three estimates of losses in consumer surplus due to the exertion of market power by the Canadian sugar refiners are presented following the framework of Figure V-1b. First estimates of deadweight social losses in consumer surplus depicted as ABE are made. Second, estimates of income transfers from consumers to sugar refiners represented by area P_1P_2BE are presented. Third, estimates of social costs which arise from unwarranted high production costs in industries with substantial market power are made.

The estimation of losses in consumer surplus involves estimating the increase in the price level denoted in Figure V-1b by $P_2 - P_1$. Unfortunately, there are limited reliable and continuous data from which the direct estimation of this "excess price" can be calculated. Three sets of estimates of excess price, expressed as a percentage of the price of refined sugar in Canada, are therefore based on the three sets of data on the rates of return in the Canadian and United States' sugar refining industries (Tables VI-7 and VI-8).[20]

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[20] Since the competitive prices for refined sugar in Canada or the United States are not observable, the increase in the price expressed as a percentage of the price of refined sugar in Canada are estimated directly from rates of return of sugar refiners in Canada and the United States.

In one case, the procedure involves subtracting the percentage price-cost margins of the cane sugar refining industry in the United States from those of the Canadian sugar refining industry. The differences are defined as a proxy measure of excess price expressed as a percentage of the price of refined sugar in Canada and are shown in Table VI-8. In a second case, the excess price as a percentage of the price of refined sugar in Canada is estimated as the difference between the annual average percentage return on equity of Atlantic, Redpath and B.C. Sugar and from that of Amstar Corporation in the United States. In the third case, the procedure involves subtracting the average rates of return on equity of the twelve largest cane sugar refiners in the United States from the corresponding rates of the three largest Canadian sugar refiners. The difference is defined as a proxy measure of excess price expressed as a percentage of the wholesale price of refined sugar in Canada.

The deadweight social loss in consumer surplus (depicted in Figure V-1b as the area ABE) is estimated from the approximation formula, Equation V-4, presented in Chapter V. The absolute value of the price elasticity of demand for sugar in Canada of 0.0805, estimated by Hassan and Johnson (1976), is used in the calculation. The annual total values of shipments of the refining industry are published by Statistics Canada.[21] The three sets of estimates of excess price expressed as a percentage of the price of refined sugar in Canada, discussed earlier, are used in the calculation of losses in consumer surplus.

The transfer of incomes from consumers to sugar refiners (depicted in Figure V-1b as the area P_1P_2BE) is calculated using the three sets of estimates of excess price and total annual value of shipments of refined sugar. The transfer of incomes is calculated as the product of the excess price rise (expressed as a percentage of the Canadian price for refined sugar) and the value of annual shipments of refined sugar products.

The estimates of the deadweight social losses and transfer effects for 1970, 1972, 1975 and 1977 are given in Table VI-9. Assuming that technical efficiency is optimum, the estimates of deadweight social losses are small relative to the annual total value of shipments of the sugar refining industry. When the estimated percentage excess price is based on the comparison of percentage price-cost margins, annual deadweight social losses range from about zero (for 1975 and 1977) to 0.01 percent (for 1970) of the annual value of shipments of the Canadian sugar refining industry. When the percentage excess price is estimated from a comparison of rates of return on equity of Canadian refiners and Amstar Corporation, the annual estimates of deadweight

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[21] Z.A. Hassan and S.R. Johnson, *op. cit.*, 37-38; and Canada, Statistics Canada, *op. cit.*, Cat. 32-222 (Issues for 1971, 1976 and 1978).

TABLE VI-9

First Estimates of Losses in Consumer Surplus*
(Expressed in 1980 dollars)

	Estimates of the percentage excess price based on			
	Percentage price-cost margins		Percentage return on equity	
Year	Deadweight loss	Transfer effects	Deadweight loss	Transfer effects
	thousands of dollars			
1970	50	24,917	132	40,365
1972	9	12,091	178	51,393
1975	0	2,651	640	141,292
1977	-2	-5,536	99	39,913

NOTES: * Estimates of excess price expressed as a percentage of the Canadian price of refined sugar are based on the comparison between the average rates of return (after taxes) on equity (shown in Table VI-7) of the three largest Canadian refiners and Amstar Corporation in the United States and from price-cost margins expressed as percentages (shown in Table VI-8) of the price of refined sugar in Canada and and the United States.

TABLE VI-10

Second Estimates of Losses in Consumer Surplus*
(expressed in 1980 dollars)

Year	Estimated excess price as percentage of price for refined sugar	Value of Deadweight losses	Value of Transferred incomes
	%	thousands of dollars	
1961	2.0	7	8,429
1963	3.1	26	22,138
1965	5.5	54	24,725
1967	4.8	36	18,864
1969	13.2	310	58,097
1971	4.7	47	25,410

NOTES: * The excess price expressed as a percentage of the price of refined sugar in Canada is estimated from the comparison of rates of return on equity (shown in Table VI-7) of the three largest Canadian refiners and twelve largest cane sugar refiners in the United States.

social losses range from about 0.02 (for 1977) to to about 0.05 percent (for 1975) of the annual value of shipments of the industry. When the estimated percentage excess price is based on the comparison of rates of return on equity of the three Canadian and twelve United States' refiners, the estimates of annual deadweight social losses range from about zero (for 1961) to 0.07 percent (for 1969) of the annual value of shipments of the refining industry for the years considered (Table VI-10).

The annual transfer estimates are about 4.8 percent of the total annual shipments of the refining industry in 1970 when the estimated percentage excess price is based on percentage price-cost margins. The estimates of losses in consumer surplus are negative for 1977. Table VI-9 indicates that when the estimated percentage excess price is based on returns, expressed as percentages of equity, of the three Canadian refiners and those of Amstar Corporation, the estimates of income transfers range from 6.2 (for 1977) to 11.2 percent (for 1975) of the value of shipments of Canadian sugar refining industry. When estimated percentages of the excess prices are based on returns expressed as percentages of equity of the three and twelve refiners in Canada and the United States, respectively, the estimates of income transferred from consumers range from about 2.0 (for 1961) to 13.2 percent (for 1969).

As expected (assuming that technical efficiency was optimum) the estimates from the three sets of data suggest that the losses in consumer surplus are attributable mainly to the transfer of incomes from consumers to the refiners rather than from the "deadweight triangle" of social losses.

A further component of losses in consumer surplus is associated with chronic excess capacity, wasteful advertising, cross-hauling and the use of suboptimal plant sizes. Also, it is expected that there are economic losses associated with lags in adopting improved technologies and management skills which minimize costs. An estimate of these "other" economic losses requires data on excess costs associated with these features. Unfortunately, data on costs are not readily available and direct measurement is difficult. The "other" social costs are estimated indirectly using the procedure outlined below.

It is worthy of note that that there has been chronic excess capacity in the sugar refining industry from 1960 to 1978. As shown in Table VI-11, from 1961 to 1971, the annual average utilization of plant capacity by Redpath, Atlantic and St. Lawrence was 62, 100 and 69 percent, respectively. These percentages of utilization of plant capacity are based on the assumption that operating the refineries for twenty four hours per day, five days per week and about fifty weeks per year constituted full capacity plant utilization. However, some evidence from court in the *Atlantic Sugar* case shows that it was possible to exceed this assumed full capacity utilization by operating the refineries for longer hours per year. Testifying before the trial court in the *Atlantic Sugar* in 1975, an engineer with Atlantic stated that it was technically feasible to operate sugar refineries on a twenty four hour-day, seven days per week and fifty weeks per year.[22] The engineer agreed that this scheduling would have increased the utilization of production capacity and reduced the costs of shut-down and start-up every week.

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[22] *The Queen v Atlantic Sugar Refineries et al.*, Pleadings before the court of appeal, Montreal, 32, 6425.

TABLE VI-11

Utilization of Annual Plant Capacity by the Sugar Refiners in Eastern Canada, 1961 to 1968

	Percentage of the potential capacity used by		
Year	Redpath	Atlantic	St. Lawrence
1961	60	100	61
1962	63	100	73
1963	61	100	74
1964	55	93	71
1965	64	96	63
1966	63	102	67
1967	63	105	70
1968	68	101	71
Average	62	100	69

SOURCE: *The Queen v Atlantic Sugar Refineries et al.*, Draft Statement of Evidence (Ottawa: Dept. of Consumer and Corporate Affairs, no date), 151.

NOTES: These data are based on operating the sugar refineries for 24 hours a day, 5 days a week and about 50 weeks per year.

In a brief to the Tariff Board in 1971, Redpath Sugar estimated that the sugar refining industry in Canada had operated at 75 percent of its potential capacity. The refiner estimated that with a two percent compound annual growth rate in the market for refined sugar in Canada, the then existing refineries had the potential capacity to supply the requirements for refined sugar in Canada for the next 15 years without additional installations.[23] Excess capacity was therefore serious in the refining industry between 1960 and 1978.

Also, as discussed in Chapter IV, between 1967 and 1972, Atlantic, Redpath and St. Lawrence substantially increased the cost of raw sugar by excessively inflating transfer prices of raw sugar. Another feature which is discussed in Chapter IV is the pricing of refined sugar in different markets in Canada by the refiners on a strict base point pricing system. It is indicated there that the Canadian refiners appropriated phantom freight rates and that cross-hauling was prevalent in the industry. It follows that economic losses of this pricing system probably were substantial for the period of time from 1960 to 1978.

For these reasons the Parker and Connor estimate of losses in consumer surplus of 2.7 percent of the value of total industry shipments, shown in Table V-1, is taken as the minimum percentage losses associated with the features outlined above. In order to test the sensitivity of the estimates of social costs associated with unwarranted high costs of refining sugar, losses in consumer surplus are also calculated assuming hypothetical cost increases of 4, 6, 8 and 10 percent of the value of annual shipments of the refining industry in Canada. Table VI-12 summarizes the estimated losses under different assumptions. The value of the estimates of losses vary from year to year in proportion to the total value of industry shipments.

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[23] *Sugar*, Reference No. 146, quoted in *The Queen v Atlantic Sugar Refineries et al.* (1976), A Draft Statement of Evidence (Ottawa: Dept. of Consumer and Corporate Affairs, Unpublished), 151.

Table VI-13 summarizes the estimates of the three components of losses in consumer surplus, that is, deadweight social losses, transfer of incomes from consumers to refiners and unwarranted high costs of production and marketing of refined sugar in 1975 and 1977. The estimates of the "other" social costs included in Table VI-13 are based on the Parker and Connor estimate of 2.7 percent of the industry shipments.

Referring to Table VI-13, the total effects of exertion of market power in the Canadian sugar refining industry in 1975 are estimated to be from \$36 million to \$176 million (expressed in 1980 dollars). These estimated losses in consumer surplus are equivalent to excess prices of from \$1.63 to \$7.99 per 100 pounds of shipments of refined sugar in 1975.[24] The total effects of exertion of market power in the Canadian sugar refining industry in 1977 are estimated to be from \$12 million to \$57 million (expressed in 1980 dollars). These estimates of losses in consumer surplus are equivalent to excess prices of from \$0.48 to \$2.31 per 100 pounds of shipments of refined sugar in 1977.

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[24] The total shipments of goods of the sugar refining industry in Canada in 1975 and 1977 were about 2,204 and 2,481 million pounds, respectively.

TABLE VI-12

Ranges of Estimates of Losses in Consumer Surplus*
(expressed in 1980 dollars)

	Estimated losses in consumer surplus using:				
	Parker and Connor percentage of the value of industry shipments	Hypothetical percentages of the value of industry shipments			
Year	2.7	4	6	8	10
	millions of dollars				
1970	13.46	19.95	29.90	39.87	49.84
1971	14.59	21.63	32.46	43.25	54.06
1973	19.07	28.24	42.36	56.48	70.60
1975	34.06	50.46	75.69	100.92	126.10
1977	17.39	25.75	38.64	51.50	64.36
1978	16.20	24.02	36.00	48.01	60.03

NOTES: Losses in consumer surplus arising from excess costs in the sugar refining industry.

TABLE VI-13

Estimates of Total Losses in Consumer Surplus Due to Market Power in the Canadian Sugar Refining Industry for 1975 and 1977 (expressed in 1980 dollars)

Year	Deadweight losses	Income transfer	Other losses	Total losses*	Loss per 100 lb sugar
	--------thousands of	dollars	----------		dollars
(1) 1975	**	2,649	33,308	35,957	1.63
(2) 1977	-2	-5,536	17,281	11,843	0.48
(3) 1975	640	141,292	34,061	175,993	7.99
(4) 1977	99	39,913	17,381	57,393	2.31

SOURCE: Summarized from Tables VI-9, VI-10 and VI-12.

NOTES: * denotes total losses in consumer surplus
The estimates of deadweight social losses and transfer of incomes in results 1 and 2 are based on an estimate of percentage excess price from the comparison of the percentage price-cost margins while results 3 and 4 are from the comparison of rates of return on equity of Canadian and United States' refining industries.
** indicates that the estimated loss is less than one thousand dollars.

Since the excess prices, expressed as percentages of competitive prices of refined sugar, are indirectly estimated it is important to treat these results with caution. Even so, the estimates of the total effects provide one indication of the impact of market power in the Canadian sugar refining industry. Though this analysis applies solely to prices at the refining level, it is noted that the vertical flow effects of excessive prices on other sectors which use sugar as an intermediate input may be substantial (Scherer, p. 403-404). Also, as Veeman (1981) noted, long-run losses in allocative and technical efficiency may be even more important than the short-run losses. Thus, the estimates in this study are likely to underestimate the actual effects of market power. The estimates suggest that there is a need for a more effective competition policy which can improve the economic performance of the Canadian industrial and service sectors in general and the sugar refining industry in particular.

VII. A SUMMARY OF THE STUDY, CONCLUSIONS AND RECOMMENDATIONS

The main features of the market structure, conduct and performance of the Canadian sugar refining industry from 1960 to 1978 have been presented in this study. The first part of this last chapter provides a summary and conclusions of the study. The results of tests of hypotheses are also summarized here. The second part of the chapter provides some recommendations arising from the findings of this study.

A. A Summary and Conclusions of the Study

An Overview of the Sugar Refining Industry in Canada

The market structure, conduct and performance of the sugar refining industry between 1960 and 1978 have reflected a number of fundamental and historical factors. First, the merger activities which took place between 1930 and 1960 contributed to the emergence of the oligopolistic market structure of the sugar refining industry in Canada. Second, the relatively small size and slow growth rate of the Canadian market for refined sugar have probably limited the number of refiners that can be established in the refining industry. The concentration of most of the population in few major cities in Canada likely has influenced the location of sugar refineries in (or around) these centers, especially where cities have been major ports. The effect has been the emergence of regional markets dominated by one or two refiners. Another feature is that products of the sugar refining process are essentially homogeneous for all refiners. Additionally, there have been limited substitutes to refined sugar. Thus, competition between refined sugar and non-sugar sweeteners has been limited.

In general, the nature of the world market for sugar seems to have had an important impact on the structure, conduct and performance of the sugar refining industry in Canada in the 1960s and the early 1970s. Canadian importers have purchased their raw sugar from a "thin" and residual world market (about 20 to 30 percent of total world trade in raw sugar) during the period under review (1960 to 1978). The effect seems to have been that the level of competition in the market to supply raw and refined sugar to Canada has been low. Evidence cited in the study indicates that there has been a high level of concentration of sugar brokers in Canada. These Canadian brokers, who have been subsidiaries of major sugar brokers in London and New York, seem to have prevented the importation of raw and refined sugar by potential competitors in Canada.

Market Structure, Conduct and Performance of the Sugar Refining Industry

The sugar refining industry in Canada has been appreciably concentrated on both the national and regional levels. The largest four refiners have controlled over 80 percent of shipments of the Canadian sugar refining industry from 1960 to 1978. In addition, evidence presented in Chapter III indicates that the moderate degree of vertical integration in this industry has had an impact on market competition in the refining industry. For example, the cited evidence indicates that because of the ownership of Redpath by Tate and Lyle, the latter appears to have deterred the supply of raw and refined sugar to potential competitors in Canada in the 1960s. An example of a case where vertical integration seems to have increased competition relates to the entry of Steinberg and George Weston into the refining industry in 1964 and 1974, respectively. The entry of these two food manufacturing and distributing firms into the refining industry can be expected to have increased competition in the Canadian market for refined sugar.

The high level of concentration (and associated low levels of market competition) in the Canadian sugar refining industry in the 1960s and 1970s seems to have been related to three main factors: the exclusionary tactics employed by eastern Canadian refiners against prospective competitors (refiners and importers of refined sugar), the apparently high levels of tariff protection afforded the refining industry and the extensive excess capacity that has existed in this industry in the 1960s and early 1970s.

It was shown in Chapter III that the level of effective tariff protection afforded the refining industry was high from 1960 to 1978. The estimates of the annual effective rates of protection for this period of time range from 11 to 212 percent, and averaged 42 percent over this period of time. Accordingly, importation of refined sugar into Canada has been negligible. Second, the Canadian preferential customs duties on imports of sugar from countries with Commonwealth ties has meant that the main sources of raw sugar to Canada have been from these countries. Imports of sugar into Canada from the most favoured nation countries have been negligible, possibly because of the higher customs duties on sugar from this group of countries. It would be expected that because of the limited number of suppliers of sugar to Canada, competition in the market to supply sugar to Canada may have suffered.

Evidence cited in Chapter IV indicates examples of strategies used by the three refiners to exclude potential competitors from the eastern Canadian market for refined sugar between 1960 and 1973. The main exclusionary tactic was to deny potential competitors in Canada access to raw and refined sugar on the world market. This was achieved in several ways. One strategy seems to have been that the refiners would purchase most of the sugar from those sources which were likely to supply potential competitors with raw sugar. It seems that exporters of raw sugar from such sources agreed to supply sugar to Canada exclusively through existing refiners. The arrangements appear to have been strictly enforced by sugar brokers in eastern Canada, New York and London and by Tate and Lyle. The effect was that in the 1960s, several independent potential sugar competitors were discouraged from entering into the market for refined sugar in Canada. Cartier and Westcane, the two refiners who successfully entered into the industry, are controlled respectively by Steinberg and George Weston, large food processing conglomerates in Canada. It is likely that the conglomerate market power of these parent companies facilitated the successful entry of Cartier and Westcane into the refining industry. It is concluded that exclusionary strategies presented substantial barriers to entry into the Canadian sugar refining industry and that the high level of concentration in the refining industry was related to the exclusionary tactics of the eastern Canadian refiners.

An analysis of utilization of plant capacity in the eastern Canadian sugar refining industry between 1963 and 1975 shows that this industry operated at less than 70 percent of full capacity. The evidence from court transcripts in the *Atlantic Sugar* case indicates that this industry had enough capacity to last for the next fifteen years from 1975. It is concluded that the excess capacity in this industry presented substantial barriers to entry. That is, not many firms would want to enter an industry with such extensive excess capacity.

It is estimated in this study that in 1963, the annual output of plants of optimum size was between 30 to 50 thousand tons of refined sugar. This plant size is observed to be much less than the capacity of all existing cane sugar refineries in 1963 in Canada. From these results it appears that the high level of concentration in the refining industry in 1963 was unlikely to have been related to the moderate economies of scale at the plant level.

After an inquiry into the patterns of market conduct of Atlantic, Redpath and St. Lawrence in the 1960s and in the early 1970s, the Crown prosecuted these refiners under the anticombines law. These refiners were charged with conspiring to lessen market competition unduly and to enhance the price of refined sugar to the detriment of the public interest. This case was decided upon by a trial court, a court of appeal and the Supreme Court of Canada in 1975, 1978 and 1980, respectively. The trial court acquitted the refiners on both charges. The court of appeal reversed the acquittal on the charge of lessening market competition through fixed shares of the market. The refiners were acquitted on the second count of unreasonable enhancement of prices of refined sugar to the detriment of the public interest. The refiners appealed and in 1980 the Supreme Court of Canada reversed the conviction. The trial court and the Supreme Court of Canada concluded that competition had not been lessened unduly by the the alleged agreement to share the market in fixed proportions. Further, both courts contended that the sharing of the market had not been the intention of the agreement. The evidence from court transcripts concerning these refiners are assessed in Chapter IV and a summary is given below.

The three features of market conduct of Atlantic, Redpath and St. Lawrence evaluated are the maintenance of constant market shares; the formula pricing of refined sugar by the three refiners; and the exclusion of potential competitors (refiners and importers) from the eastern Canadian market for refined sugar. This last feature is already summarized above and is not further considered here.

The hypothesis that there was not a significant difference between the means of market shares for the period of time from 1940 to 1949 and from 1961 to 1973 for the shares of Atlantic, Redpath and St. Lawrence was evaluated using the t statistic. This hypothesis was accepted at the 1 percent level of significance for the market shares of each of these refiners. The results indicate that market shares of each of Atlantic, Redpath and St. Lawrence have been stable from 1940 to 1973 though economic conditions in the refining industry seem to have changed substantially. Both the cited evidence from court transcripts in the *Atlantic Sugar* case and economic theory of oligopolistic market behavior outlined in Chapter IV suggest that eastern Canadian sugar refiners applied a quota rule as an effective means of maintaining stable market shares. It is concluded that the maintenance of stable market shares was an efficent way of deterring off-list pricing and lessening competition in the refining industry. The results of the assessment of strategies used by the three refiners to maintain market shares suggest that stable market shares were associated with substantial lessening of competition in the eastern Canadian market for refined sugar for the period of time from 1960 to 1973.

Another feature of market conduct assessed is the pricing of refined sugar at the plant-gates on a cost-plus formula by Atlantic, Redpath and St. Lawrence between 1960 and 1974. There is no evidence that the situation has changed since 1974. The standard cost components included the price of raw sugar as reported daily on the London Sugar Terminal market, insurance, transportation, handling and customs duty (including the preferential margin remitted to raw sugar exporters). A certain refining margin was added to these costs to cover refining costs and profit margins. The analysis in Chapter IV indicates that by using this standard procedure, Atlantic, Redpath and St. Lawrence arrived at identical price lists. Though there has been a debate as to whether the pricing of refined sugar was due to collusion or conscious parallelism, the adoption of a common pricing formula is indicative of covert collusion. Another objection to this cost-plus formula of pricing refined sugar by the three refiners was that, on occasions, some of the costs included in the formula were higher than actual costs. Thus, Canadian consumers paid higher prices for refined sugar than were warranted by the actual costs.

As outlined in Chapter IV, during 1960 to 1974, the base point pricing system was used by Canadian refiners to price sugar in spatially separated markets. The main base point was Montreal. This system has ensured uniform delivered prices for all refiners in any particular market irrespective of the source of refined sugar. The discussion in Chapter IV suggests that the pricing of refined sugar on the bases of these two standard procedures resulted in identical price lists of Atlantic, Redpath and St. Lawrence during the 1960s and early 1970s. Apparently identical prices appear to have lessened price competition in the refining industry. It can be inferred that allocative efficiency suffered due to these procedures of pricing refined sugar.

It seems evident that the three features outlined above had adverse effects on competition in the refining industry between 1960 and 1973. However, these patterns of market conduct do not appear to be prohibited under the present anticombines law, especially if these patterns seem to arise from conscious parallelism.

Allocative Efficiency of the Sugar refining industry

Allocative efficiency in the Canadian sugar refining industry between 1960 and 1978 is assessed using three different approaches. First, an assessment of the relationships between prices of sugar at different stages of the marketing system and in different markets is made. Second, profits of Canadian refiners are evaluated. Third, estimates of losses in consumer surplus due to exercise of market power by Canadian refiners is presented.

The relationships between prices of sugar are assessed using correlation and regression analyses and graphical illustrations. First, correlation coefficients between changes over time in annual average sugar prices in London, New York and Montreal are calculated for the period of time from 1961 to 1978. Second, regression analyses of the first differences of monthly wholesale prices of refined sugar in Montreal (the dependent variable) and the averages of the monthly wholesale prices for refined sugar in the United States (the independent variables) are used to evaluate the relationship of prices of refined sugar in these markets for different periods between 1970 and 1977. These two techniques are also used to evaluate the relationships between monthly wholesale prices of refined sugar in Montreal and a series of monthly retail prices of refined sugar in fourteen major cities in Canada for the period of time from 1973 to 1980.

The results show that prices of raw sugar in London, wholesale prices in New York and the United States are significantly correlated with wholesale prices of refined sugar in Montreal during 1960 to 1978. The hypothesis that there is not a significant relationship between wholesale prices of refined sugar in Canada and the United States was rejected. Similarly, wholesale prices for refined sugar in Montreal and retail prices in fourteen major cities in Canada are significantly correlated for the period of time from 1973 to 1980. The hypothesis that there is not a significant relationship between wholesale prices of refined sugar in spatially separated markets in Canada was rejected.

In a competitive market, the results outlined above would suggest high levels of allocative efficiency. This is not the case for the Canadian sugar refining industry. As outlined above, the high correlations are probably due to the procedures of pricing refined sugar on the cost-plus and base point systems by all Canadian refiners. That is, prices of refined sugar appear to be administered by the refiners.

It is noted in Chapter VI that during 1970 to 1973 when imports of sugar into the United States were restricted through quotas, the relationship between prices in the two countries was weak. It is concluded that market competition between refiners in the two countries during this period may also have been weak. Also, though retail prices of refined sugar in different Canadian markets are significantly correlated, it seems that there are unwarranted geographical price spreads for refined sugar between different sugar refineries and different markets in Canada. First, the relatively higher levels of prices of refined sugar in western Canada than those in eastern Canada do not appear to be warranted by transportation costs. Considering the monopoly position of B.C. Sugar in western Canada and the relatively high rates of profits earned by this refiner, it is concluded that much of the higher prices of refined sugar in this region are attributable to the exercise of market power by B.C. Sugar. Second, cities in which sugar refineries are located did not report the lowest retail prices of refined sugar. This feature can be attributed to the monopoly power of most refiners in the cities in which they are located. On the basis of these results, it can be concluded that allocative efficiency in the sugar refining industry in Canada was not satisfactory between 1973 and 1980.

The t test was used to compare average profit rates in the Canadian refining industry and United States cane sugar refining industry for different periods of time between 1960 and 1978. The three sets of t statistic show that rates of return in the Canadian sugar refining industry were significantly higher than those in the cane sugar refining industry in the United States during these periods. The hypothesis that average profit rates in the Canadian sugar refining industry have been significantly higher than in the cane sugar refining industry in the United States for the period of time from 1960 to 1978 was accepted. The results indicate that above normal profits have been earned by Canadian refiners between 1960 and 1978.

The hypothesis that there is a significant relationship between the effective rates of tariff protection afforded the Canadian sugar refining industry and profit rates in this refining industry from 1960 to 1978 was tested using correlation analysis. The results showed that there was not a significant relationship between these two variables when rates of return on equity were used as the measure of profits. However, there was a significant relationship when the price-cost margins, expressed as percentages of oligopolists' price of refined sugar, are used in this test. The results of the test of this hypothesis were, therefore, not conclusive.

Different estimates of social costs and income transfers attributable to exercise of market power in the Canadian sugar refining industry in 1977 were made. These ranged from about $12 million to $57 million and are equivalent to a price rise of from $0.48 to $2.31 per 100 pounds of refined sugar (Expressed in 1980 dollars). That is, Canadian consumers may have paid from about $0.48 to $2.31 per 100 pounds of refined sugar more than was warranted by costs and normal profits.

B. Recommendations of the Study

The recommendations of this study are based on the results of the analyses. These recommendations are aimed at improving the welfare of the consumer and may ignore gains which may accrue to the refiners due to exercise of their market power.

In general, the patterns of market conduct of sugar refiners revealed in this study appear to be those which would be expected from the theory of tight oligopolies. In an industry where there are few firms, interdependence will be high. It appears that one way of improving market performance is to reduce the levels of concentration in the refining industry, probably by preventing exclusion of new entrants into the industry.

The first recommendation is that the level of effective tariff protection afforded the Canadian sugar refining industry should be reduced. This should increase the extent of actual and potential competition in the Canadian market for refined sugar. This recommendation should be implemented by reducing the difference between the Canadian customs tariff rates on raw and refined sugar by reducing the nominal tariff rates on refined sugar. In addition, it is suggested that the multiple customs tariff rates (the British preferential, most favoured nation, and general tariff rates) be abolished. This could be replaced with uniform tariff rates for each form of sugar, irrespective of the source of sugar imported into Canada. This recommendation is likely to increase competition in the market to supply sugar to Canada.

A recommendation which arises out of the evidence presented in Chapter IV is that the anticombines law should be amended to prohibit features of market conduct which arise from common policies of one or more firms that act as if they are a monopoly. Though the section of anticombines law concerning exclusive dealing could have been applied in the *Atlantic Sugar* case to prosecute the exclusionary practices of the largest three refiners (Atlantic, Redpath and St. Lawrence) this was not applied because the practices were not due to collusion. As outlined in Chapter IV, the anticombines law should be amended to prohibit exclusionary practices of individual dominant (as well as collusive) firms. In addition, domestic brokers might be prosecuted for refusal to sell to new entrants. This policy would probably prevent one or more firms from following strategies which are likely to have adverse economic effects on the performance of an industry. It is hoped that with a more effective anticombines law, competition policy could be applied more effectively to the Canadian industrial and service sectors.

It is recommended that further research be conducted to update the results indicating moderate economies of scale at the plant level. Also, further research should be conducted to determine the extent of economies of scale of multiplant firms and of transporting refined sugar. The results of the research could be used to implement policies that would encourage increased competition in the refining industry. One option could be to apply existing policies and programs so as to avoid encouraging new plants which are much larger than the minimum optimum size. Further, if economies of multiplant operation are not large, each Canadian refiner could be discouraged from operating many refining plants. Multiplant firms could be discouraged through tax penalties and through restricting licences to established firms for new plants. Entry of new firms could be encouraged by increasing subsidies to these firms, especially in the form of DREE locational grants to new firms. These policies could encourage an increased number of refiners and thus encourage increased competition in this industry. A closely related recommendation is to discourage the entry of the existing Canadian sugar refiners into the high fructose corn sweetener industry. This policy could have the effect of encouraging some competition between these two industries.

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APPENDICES

APPENDIX II-1

Principal Statistics on Refined Sugar in Canada, 1960 to 1980

	Total quantity of Refined Sugar							
Year	manufactured cane and beet sugar	Imports	Exports	closing stocks	consumption	Industrial use	Direct use	Per capita consumption
	Million of pounds							pounds
1960	1,735	1	8	410	1,662	806	856	93.3
1961	1,636	9	16	389	1,649	846	803	90.4
1962	1,789	2	23	412	1,746	874	872	94.0
1963	1,842	16	99	453	1,708	891	817	90.4
1964	1,869	27	31	405	1,913	928	985	99.2
1965	1,985	2	37	393	1,961	1,007	954	99.8
1966	2,056	3	34	410	2,035	1,109	926	101.7
1967	2,073	6	43	286	2,029	1,184	845	99.4
1968	2,107	6	48	226	2,112	1,230	882	101.8
1969	2,171	1	32	281	2,091	1,264	827	99.3
1970	2,250	1	30	221	2,229	1,328	901	104.3
1971	2,268	*	25	182	2,228	1,361	920	105.7
1972	2,321	1	37	214	2,253	1,360	893	103.2
1973	2,420	1	131	174	2,339	1,495	844	105.9
1974	2,192	91	87	165	2,204	1,416	790	87.4
1975	2,111	113	177	126	2,085	1,352	733	97.4
1976	2,198	62	106	162	2,121	1,387	734	89.1
1977	2,505	5	295	258	2,308	1,400	908	102.1
1978	2,559	2	270	261	2,312	1,502	810	100.0

SOURCE: Canada, Statistics Canada, *Cane and Beet Sugar Processors* Cat. 32-222 (Ottawa: Various issues, 1960 to 1979).

NOTE: * indicates that imports were less than one million pounds.

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APPENDIX II-2

Statistics on Some Major Inputs in the Refining of Sugar in Canada, 1960 to 1978

Year	Salaries & wages	Cost of fuel & electricity	Cost of material	value of shipments	value-added	Number of employees
	-----	-----	thousand of dollars	-----	-----	
1960	13,838	2,836	91,132	130,405	43,988	3,213
1961	14,286	2,685	87,040	133,453	40,687	3,151
1962	15,239	2,872	90,936	141,235	49,463	3,134
1963	16,234	2,898	182,346	232,715	59,958	3,163
1964	16,859	3,039	168,475	228,272	46,383	3,205
1965	17,197	3,203	95,225	152,765	51,907	3,192
1966	17,144	3,144	90,201	145,781	50,907	3,043
1967	18,512	3,146	84,882	143,506	55,943	3,129
1968	20,505	3,413	90,513	152,194	59,749	3,149
1969	20,985	2,993	113,299	174,582	65,946	2,978
1970	22,452	3,096	133,339	204,473	70,219	2,964
1971	23,978	3,446	154,350	228,216	67,933	2,878
1972	24,557	3,769	201,834	267,472	71,329	2,836
1973	26,171	4,131	255,841	335,789	79,492	2,685
1974	30,767	5,612	616,728	650,920	71,984	2,832
1975	35,311	7,594	598,967	737,543	107,974	2,780
1976	39,155	9,625	382,455	471,646	79,800	2,803
1977	44,530	12,002	326,473	436,963	109,858	2,860
1978	46,639	14,461	323,862	443,970	113,976	2,878

SOURCE: Canada, Statistics Canada, *Cane and Beet Sugar Processors* Catalogue 32-222 (Ottawa: Various issues).

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APPENDIX III-1

Sources of Raw Sugar Imported into Canada, 1960 to 1978

Year	Commonwealth countries	South Africa	Total imports from B.P. countries	total imports	imports from B.P.* as a percentage of total imports
			tons		
1960	537,909	20,859	557,868	617,110	91
1961	602,218	36,494	638,712	689,247	93
1962	665,275	50,190	715,465	754,749	95
1963	589,217	79,203	668,422	752,766	89
1964	605,235	86,796	692,031	735,909	94
1965	601,115	115,719	780,320	877,100	89
1966	595,093	127,482	722,575	808,904	89
1967	611,495	241,146	852,641	617,110	91
1968	579,773	271,860	851,378	907,005	94
1969	685,157	228,102	913,259	996,198	92
1970	686,449	214,396	900,845	999,229	90
1971	637,250	224,397	861,647	947,714	91
1972	668,620	245,493	914,113	957,379	95
1973	678,830	277,719	956,549	1,017,154	94
1974	601,819	179,188	781,007	947,580	82
1975	418,988	324,590	806,579	1,038,701	78
1976	433,711	336,384	770,095	940,778	82
1977	667,028	317,344	984,372	1,118,470	88
1978	598,618	275,900	874,520	1,083,333	81

SOURCE: International Sugar Organization, *Sugar Yearbook* (London: Various issues).

NOTE: B.P. denotes countries to which the Canadian British preferential rates of customs tariff apply.

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APPENDIX IV-1

Percentage Market Shares of the Eastern Canadian Market for Refined Held by Atlantic, Redpath and St. Lawrence, 1940 to 1973

	Market shares of		
Year	Atlantic	Redpath	St. Lawrence
	percentages		
1940	35.8	42.8	21.4
1941	34.8	42.3	20.9
1942	34.2	42.6	23.2
1943	34.9	43.0	20.8
1944	36.6	43.7	21.4
1945	36.6	42.4	21.0
1946	36.3	42.0	21.7
1947	34.3	43.6	22.2
1948	36.3	42.2	21.6
1949	35.0	42.6	22.4
1950	35.3	42.5	22.3
1951	36.4	44.6	19.0
1952	35.1	41.8	23.1
1953	35.3	43.6	21.1
1954	35.5	42.6	21.9
1955	35.0	43.5	21.5
1956	35.1	42.5	22.4
1957	35.0	42.8	22.2
1958	32.0	46.6	22.4
1959	31.4	44.6	24.0
1961	35.8	43.8	20.4
1962	33.7	43.6	22.7
1963	35.7	42.4	21.9
1964	35.0	43.3	21.7
1965	35.4	43.9	20.7
1966	35.1	41.9	23.0
1967	35.8	43.2	21.0
1968	35.5	42.4	20.1
1969	35.6	42.8	21.6
1970	35.0	42.7	22.3
1971	36.2	42.1	21.7
1972	33.4	43.9	22.7
1973	32.9	43.9	23.4
Average for 1940 to 1973	35.1	43.1	21.8
Government allocation 1940 to 1949	35.5	43.0	21.5

SOURCE: *The Queen v Atlantic Sugar Refineries et al.* (1978), Pleadings Before the court of appeal, 32, 6396-97.

APPENDIX VI-1

Annual Prices of Raw and Refined Sugar in London, Montreal and New York, 1961 to 1978

	Price of sugar in					
	London	Montreal		New York		
Year	raw sugar (LDP)	Wholesale	retail	raw (CIF)	Wholesale	retail
	Canadian dollars per 100 pounds of refined sugar					
1961	2.95	7.04	9.31	6.38	9.33	12.00
1962	3.19	7.20	11.01	6.89	10.06	12.51
1963	9.17	13.75	19.31	6.82	12.62	14.67
1964	6.28	11.02	11.11	7.44	11.29	13.86
1965	2.29	6.83	9.49	7.28	10.80	12.72
1966	1.95	6.38	9.46	7.53	10.93	12.93
1967	2.10	6.62	9.48	7.85	11.23	13.05
1968	2.05	6.68	9.59	8.10	11.42	13.15
1969	3.45	8.29	10.98	8.35	12.08	13.05
1970	3.85	8.98	11.48	8.43	12.26	13.57
1971	4.52	9.90	12.52	8.60	13.36	13.73
1972	7.34	12.18	15.55	9.00	12.71	13.77
1973	9.61	13.80	13.60	16.30	10.29	15.10
1974	29.50	38.92	40.58	28.85	32.69	31.59
1975	20.84	29.60	37.00	22.84	31.96	38.62
1976	7.26	18.93	24.00	13.12	18.93	24.00
1977	7.52	17.55	20.20	11.69	18.40	21.60
1978	9.13	17.00	21.10	15.85	23.83	24.10

SOURCE: Canada, Statistics Canada, *Cane and Beet Sugar Processors* Cat. 32-222 (Ottawa: Various Issues); International Sugar Organization *Sugar Yearbook* (London: Various issues); and U.S.D.A., *Agricultural Statisics* (Washington D.C.: 1966 and 1979).

NOTES: LDP denotes the London daily price for raw sugar free-on-board at Carribean ports.
CIF denotes cost insurance and freight paid

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APPENDIX VI-2

Monthly Wholesale Prices of Refined Sugar in Montreal and the United States, 1970 to 1977

Year and month	Wholesale price of refined sugar in Montreal	Wholesale price of refined sugar in the United States
	Canadian dollars per 100 pounds	
1970 J	8.29	10.94
F	8.34	11.08
M	8.78	10.94
A	8.83	10.94
M	9.09	10.94
J	9.09	10.94
J	9.18	11.28
A	9.04	11.28
S	9.10	11.28
O	9.20	11.43
N	9.29	11.43
1971 F	9.85	11.43
M	9.90	10.72
A	9.70	10.62
M	9.69	10.62
J	9.36	10.82
J	9.46	11.82
A	9.50	11.82
S	9.18	11.82
O	9.62	11.82
N	9.81	11.82
D	11.05	11.82
1972 J	13.50	11.82
F	11.97	12.21
M	11.97	12.21
A	11.97	12.41
M	11.97	12.41
J	11.97	12.41
J	11.08	12.41
A	11.55	12.41
S	11.30	12.41
O	12.40	12.36
N	11.40	12.16
D	12.50	12.16

APPENDIX VI-2
CONTINUED

	Wholesale price of refined sugar in	
Year and month	Montreal	the United States
	Canadian dollars per 100 pounds	
1973 J	12.61	12.16
F	9.85	13.18
M	9.80	13.18
A	13.14	13.30
M	13.24	12.75
J	13.26	12.75
J	13.26	13.15
A	13.36	13.68
S	13.46	13.68
O	13.56	14.12
N	14.82	14.95
D	18.70	12.80
1974 J	22.19	14.32
F	27.93	16.13
M	29.10	19.95
A	30.23	19.95
M	31.49	24.80
J	32.45	28.48
J	32.73	31.91
A	30.94	33.77
S	42.78	39.50
O	49.48	40.83
N	69.64	53.93
D	53.42	59.25
1975 J	47.60	51.80
F	47.75	47.88
M	37.28	41.02
A	35.30	36.12
M	26.29	31.91
J	21.29	25.93
J	24.65	26.79
A	29.77	28.29
S	24.20	23.18
O	22.57	20.47
N	21.95	20.73
D	21.15	19.36

APPENDIX VI-2
CONTINUED

	Wholesale price of refined sugar in	
Year and month	Montreal	the United States
	Canadian dollars per 100 pounds	
1976 J	22.62	20.87
F	21.49	20.34
M	22.98	22.10
A	21.60	21.02
M	22.34	22.25
J	21.37	19.75
J	21.18	20.43
A	18.29	17.10
S	15.66	15.19
O	15.75	17.20
N	15.42	15.97
D	15.50	15.63
1977 J	16.35	15.97
F	16.85	16.71
M	17.85	17.10
A	18.69	18.08
M	17.90	17.20
J	17.05	15.73
J	16.54	15.09
A	17.10	17.25
S	16.89	16.51
O	16.22	17.81
N	15.54	19.11
D	17.33	18.47

SOURCE: Canada, Statistics Canada, *Consumer Prices Indexes and Processors*, Catalogue 32-222 (Ottawa: Various issues); and U.S. Department of Labor, *Wholesale Prices and Indexes* (Washington D.C.: various issues, 1972 to 1977).

APPENDIX VI-3

Monthly Retail Prices of Refined Sugar in Fourteen Major Cities in Canada, 1973 to 1980

Name of city	J	F	M	A	M	J	J	A	S	O	N	D
	Retail price of refined sugar in the month of											
	1973											
	cents per pounds of refined sugar											
St. Johns	15.4	15.7	16.0	16.1	16.2	16.5	14.8	16.6	17.0	16.5	16.4	19.2
Halifax	14.8	14.8	14.8	14.4	14.9	14.9	15.2	15.2	15.1	15.2	15.2	15.7
St. John	15.4	15.4	15.4	15.2	15.9	16.1	15.9	16.0	15.7	15.7	15.6	18.1
Quebec	14.5	14.4	14.7	14.6	15.4	15.6	15.6	15.6	15.7	15.9	16.0	16.2
Montreal	14.6	14.5	14.5	14.6	15.3	15.3	15.3	15.5	15.4	15.6	15.7	16.0
Ottawa	14.4	14.4	14.4	14.4	15.1	15.2	15.2	15.2	15.2	15.6	15.5	15.5
Toronto	14.8	15.0	14.6	14.3	14.9	14.9	14.9	14.9	14.8	14.8	15.0	15.4
Thunder Bay	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.2	17.3	17.2	17.2	17.2
Winnipeg	16.2	16.3	16.3	16.3	17.2	17.2	17.2	17.3	17.3	17.1	17.1	17.0
Saskatoon	17.4	17.4	17.4	17.4	17.5	17.8	17.8	17.8	17.8	17.7	17.8	17.7
Regina	17.1	17.2	17.2	17.3	17.4	17.7	18.2	18.3	18.4	18.3	18.5	18.6
Edmonton	17.2	17.2	17.2	17.2	17.2	18.0	18.2	18.2	18.2	18.9	19.0	19.0
Calgary	16.1	16.1	16.0	16.0	16.0	16.1	17.0	17.3	17.3	17.2	17.2	17.1
Vancouver	13.8	14.5	14.6	14.6	14.6	16.5	16.5	16.5	16.5	16.6	16.6	16.7

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APPENDIX VI-3
CONTINUED

Name of city	1974 J	1974 F	1974 M	1974 A	1975 O	1976 O	1977 A	1978 A	1978 O	1979 O	1980 A	1980 O
	Retail price of refined sugar in the month of											
	Cents per pounds of refined sugar											
St. Johns	25.2	29.9	37.5	35.9	33.8	26.4	26.8	27.1	26.9	30.0	51.1	74.1
Halifax	20.1	21.5	32.1	30.7	31.6	19.8	24.2	20.8	23.0	22.2	45.9	75.0
St. John	20.2	25.5	34.4	32.8	31.3	20.4	24.6	22.1	22.8	30.9	48.9	80.0
Quebec	22.1	25.3	34.7	32.9	31.8	19.7	23.6	22.6	24.1	28.8	42.0	71.1
Montreal	22.5	25.3	33.7	31.9	31.9	19.3	23.9	22.3	23.6	28.4	42.7	70.9
Ottawa	21.6	24.6	32.5	30.9	32.1	19.3	23.4	22.4	23.5	28.0	43.0	68.6
Toronto	22.8	25.5	33.6	31.2	32.9	16.0	20.3	22.6	21.3	31.4	48.0	78.4
Thunder Bay	21.9	27.9	34.6	33.2	36.4	23.9	25.0	25.1	25.4	30.5	47.1	62.7
Winnipeg	19.1	28.0	32.2	32.6	33.9	22.2	25.6	25.3	26.3	29.3	46.1	66.8
Saskatoon	17.8	28.6	34.5	33.7	37.9	25.9	31.4	28.2	30.2	33.9	51.6	84.1
Regina	18.8	27.9	33.7	34.7	35.0	25.8	29.7	26.6	27.4	32.5	50.5	80.2
Edmonton	19.3	27.1	33.0	35.7	36.9	25.4	26.8	26.9	27.6	30.3	52.1	74.3
Calgary	21.2	25.5	32.6	32.8	34.8	24.0	25.8	26.0	28.0	31.6	48.9	73.9
Vancouver	21.0	26.4	31.8	31.3	39.7	22.6	26.7	23.5	26.6	31.5	47.5	75.7

SOURCE: Canada, Statistics Canada, *Consumer Prices and Price Indexes* Catalogue 62-010 (Ottawa: Various issues); and Food Prices Review Board, *Sugar Prices and Policies* (Ottawa: 1974), 53.

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